JANUARY 1946

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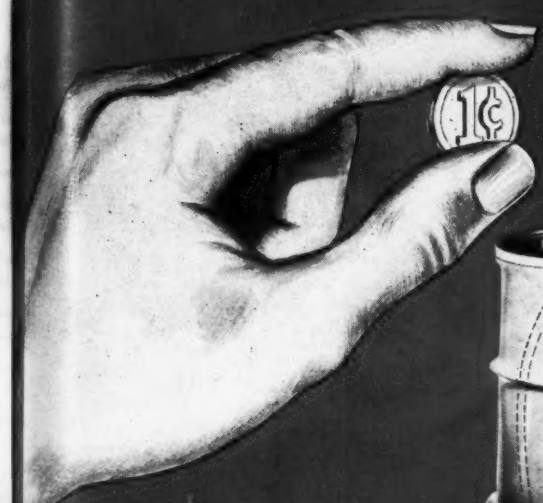
Digest of Highway Literature

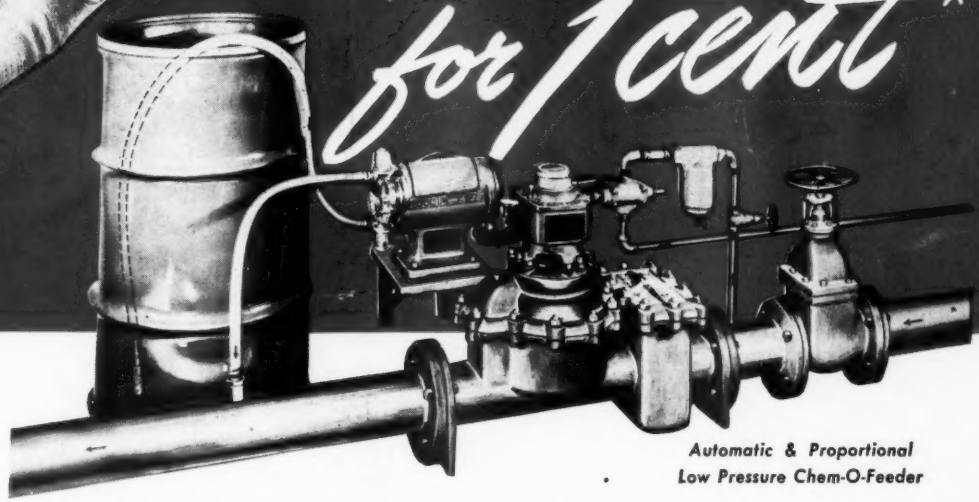
Demineralizing Water

An English Sewage Filter

Public Works



Hypochlorination Equipment for over 20,000 Gallons of Water *for 1 cent



Automatic & Proportional Low Pressure Chem-O-Feeder

That is the cost over a 10 year period of %Proportioneers% Automatic & Proportional Hypochlorination equipment for a 500,000 gallon per day gravity water supply.

For this insignificant cost your community can not afford to be without the adequate protection supplied by continuous chlorination with %Proportioneers% accurate, safe and dependable Chem-O-Feeder. What water department customer would be unwilling to shoulder his share of such a *health insurance investment* if aware of the small equipment expense per gallon to sterilize his water supply for protection against water borne disease?

Other water supply companies using more or less than 500,000 gallons daily can also have this protection of continuous sterilization for a correspondingly small investment. Write today for cost data on your Automatic & Proportional Chem-O-Feeder. You need only tell us your daily average consumption, minimum and maximum GPM flow and the water pressure at the proposed installation location.

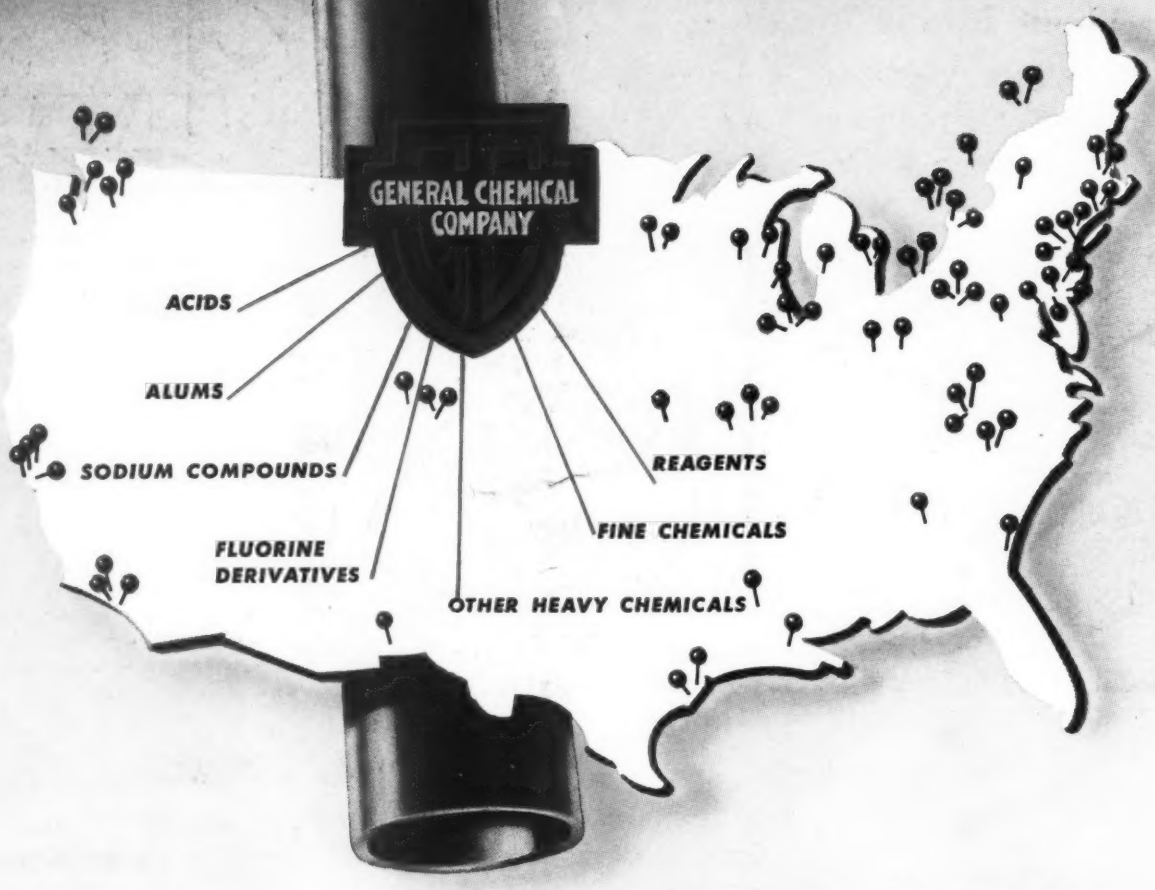
***BEFORE YOU SEND IN YOUR PENNY READ THIS:** Figure based on complete equipment needed to inject hypochlorite solution against less than 100 psi, including mechanical water meter to control chemical feeder through range of 20 to 525 GPM. Solution tank and chlorine residual test kit are included, plus estimated maintenance cost and depreciation over a period of ten years.

% PROPORTIONEERS, INC. %

96 CODDING STREET • PROVIDENCE 1, R. I.

3

Supply Line for American Industry...



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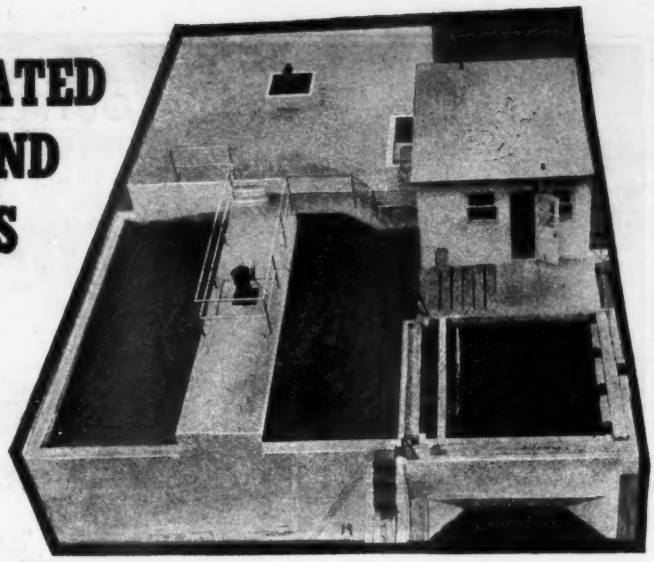
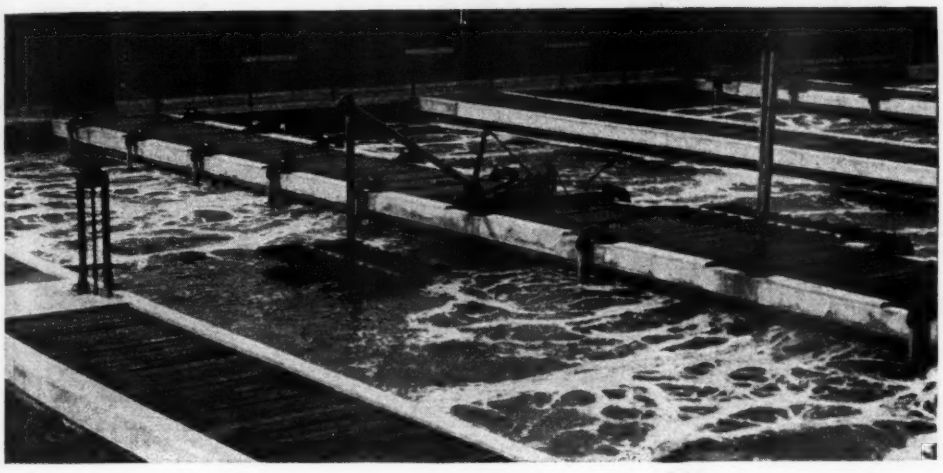
165 OF 300 NEW ACTIVATED SLUDGE PLANTS SHOW TREND TO "CHICAGO" PROCESS EQUIPMENT

These Plants Have Continuous Records of Successful Process Control for Simple Operation



Chicago "Package" sewage treatment plant at Consolidated-Vultee Aircraft Corp., Miami Springs, Fla.



Chicago Wide Band Air Diffusion System with Swing Diffusers at Omaha, Neb., Sewage treatment plant.

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Specialization in equipment and process control since 1933. Equipment rationally designed for process control requirements.

Overall application engineering service based on 12 years operating experience.

Initial operation and regulation and operator training goes with each "Chicago" equipped plant.

We shall welcome the opportunity to send you recommendations and equipment application information for your specific problems.

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SEWAGE EQUIPMENT DIVISION

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Flush-Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs, Water Seal Pumping Units, Samplers.

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VOL. 77 PUBLIC WORKS No. 1
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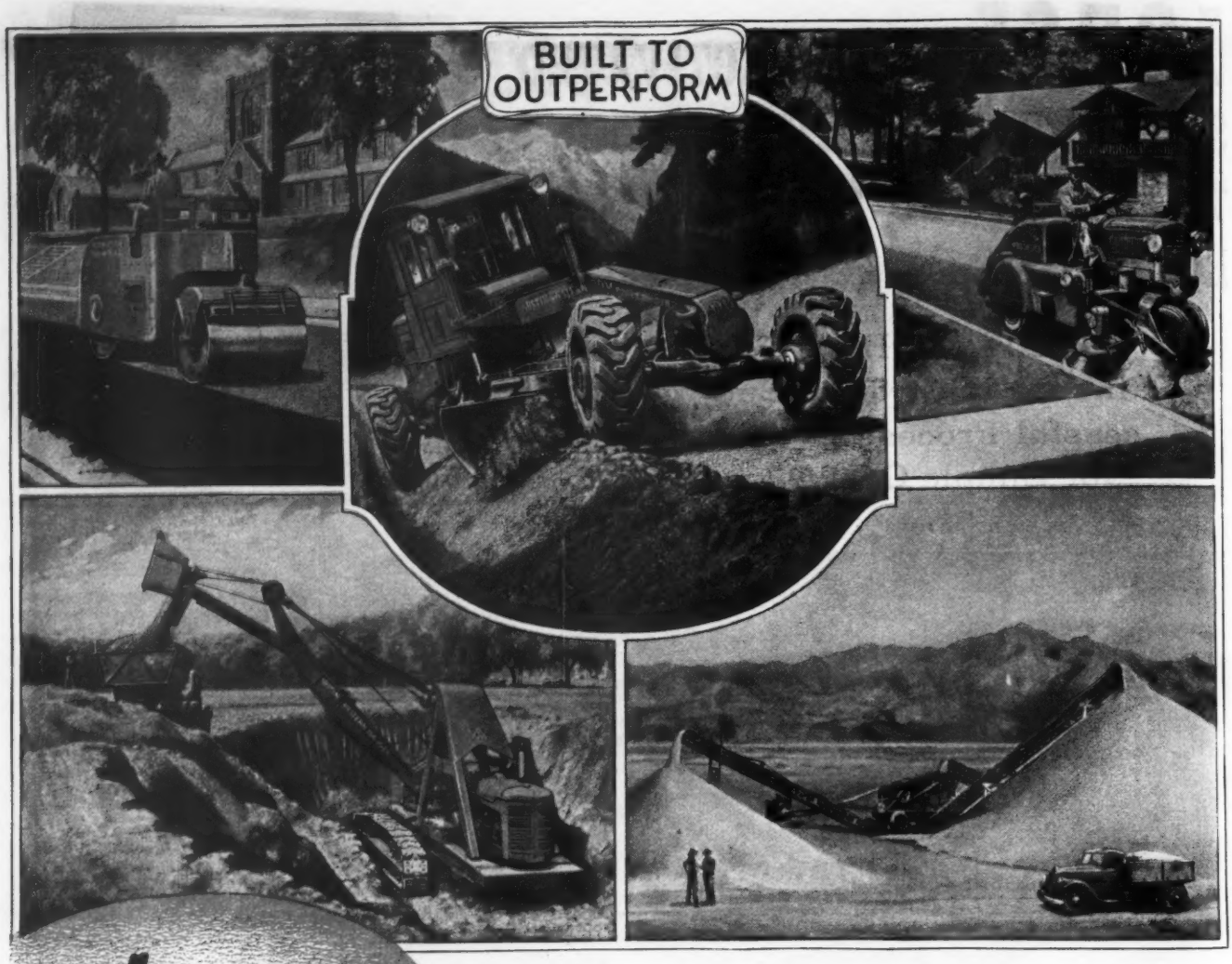
JANUARY, 1946



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SINCE 1859

Col. Hardenbergh Returns to Public Works

Col. W. A. Hardenbergh has returned to PUBLIC WORKS after 5 years and 3 months in the Army and will assume direction of the editorial department. During his long period of duty, Col. Hardenbergh organized the sanitary engineering program of the Army and directed its activities throughout the world, wherever American troops were operating. He reorganized the Sanitary Corps, established new high standards of technical training and experience for it, and built it up to a peak strength of 2900 officers. The leadership he provided made the Sanitary Corps outstanding in morale and technical accomplishments throughout the Army. It was a prime factor in providing for the American soldier a water as safe, or safer, than he had at home; in controlling malaria, so that this disease was not, during the past two years, a handicap to military operations; and it set high standards in the disposal of waste. Sanitary Corps officers overcame the threat of scrub typhus in the Pacific, and successfully combated schistosomiasis, amebic dysentery, plague and other tropical diseases throughout the world.

PUBLIC WORKS is most happy to have Col. Hardenbergh with it again, both personally and because it means that its readers and the engineering field will profit very greatly.

J. T. MORRIS,
President

It is with a great deal of pleasure that I am returning to PUBLIC WORKS Magazine after my long absence in the Army. The opportunity offered here to work for the improvement of engineering and the betterment of engineers is something I have long looked forward to.

The young men of the Sanitary Corps, with whom I have been so long associated, will always seem to me the most marvelous group of technical men ever gathered into one organization; but time will serve only to deepen the debt I feel to the many others who contributed so materially to the needs and the welfare of the Army—the men of the Corps of Engineers and of the Public Health Service; the State Sanitary engineers; the consulting engineers; and the men in so many manufacturing and business firms. It was a very great privilege to have been able to work with these men, and I am looking forward to seeing them all again, as a civilian, and to serving them in any way possible.

W. A. HARDENBERGH

PUBLIC WORKS

Founded in 1896

Devoted to the interests of the engineers and technical officials of cities, counties and states

Vol. 77 No. 1

W. A. HARDENBERGH and A. PRESCOTT FOLWELL
Editors

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IF YOU HAVE A FEEDING PROBLEM

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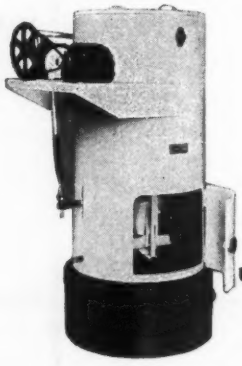
Don't pussy-foot around that chemical feeding problem go straight to Omega! There's no feeding problem that Omega Volumetric or Gravimetric Feeders have failed to solve. Today Omega is feeding a wide variety of dry materials—including lime, soda ash, alum, Ferrisul, Ferrifloc, carbon, etc.



OMEGA UNIVERSAL FEEDER, Volumetric type.

The Omega Universal features unfailing operation. Large throat and orifice openings, with oscillating throat producing effective agitation at the outlet zone, make the Universal dependable and accurate for feeding all water treating chemicals—from 1¼" lumps down to fine powder. Dissolving chambers of proper capacity are furnished for rate of feed specified; extension hoppers, dust filters and proportional feeding controls are available. Write for information.

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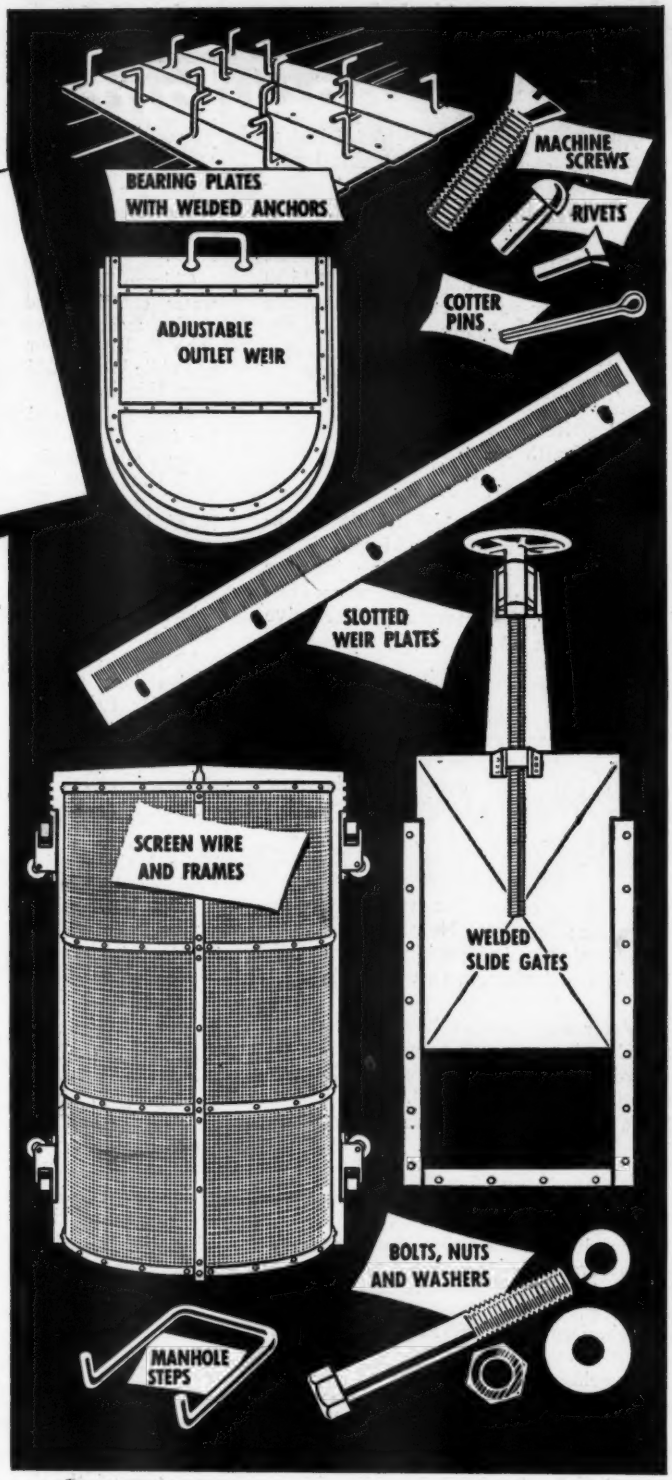

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Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

When you need special information—consult the classified READER'S SERVICE DEPT., pages 71-73

Jobs Available to Engineers

Additional items will be published as available. Those seeking technical personnel are invited to write Col. Hardenbergh, this office.

Assistant sanitary engineers, state and local health departments, $2500 to $3600 for young engineers who are fairly recent graduates. Also some openings for directors of sanitary engineering divisions for State Boards of Health, $3200 to $4500. Dr. F. T. Foard, Director District No. 8, U. S. Public Health Service, Denver 2, Colorado.

Director, Division of Sanitary Engineering, Colorado State Health Dept., $3600 to $4500, with possible increase immediately to $5200 maximum. Dr. R. L. Cleere, Secretary and Executive Officer, State Office Bldg., Denver 2, Colorado.

Link-Belt Co., Philadelphia, Pa., needs 2 recent graduates for drafting room, later for sales work. Base pay $3000 but with overtime this now amounts to about $4,000. Col. J. J. Gilbert, Manager, Sanitary Engineering Division.

Assistant editor for a water works magazine; location, New York; salary undetermined. Information from Col. W. A. Hardenbergh, this magazine.

Water and sewage laboratory officer to take charge of that section of State Board of Health Laboratories; $225 per month to start. Write Col. L. K. Clark, State Board of Health, Bismarck, N. D.

Additional Openings

Pennsylvania State College, sanitary chemist, background in sanitary bacteriology and biology. Carries the rank of Assistant Professor; salary, $3,600 to $4,000. Write Prof. G. A. Rohlich, Dept. of Civil Engineering, State College, Pa.

Massachusetts Institute of Technology, one or two men as Graduate Assistants while working toward Master's degree or Doctorate; also a Research Assistant for someone qualified to do biochemical research. Write Prof. W. E. Stanley, MIT, Cambridge, Mass.

The Texas Company, a sanitary engineer for assignment in Iran. Salary scale $5,000 to $7,500, plus maintenance. Write Col. Hardenbergh, this office.

City of Wilmington, Delaware, sanitary engineer for the Health Department, $4,000. Dr. A. P. Hitchens, Health Officer.

Instructor or assistant professor in sanitary engineering, $4,000 or up. Write Dr. Abel Wolman, 211 Latrobe Hall, Johns Hopkins University, Baltimore, Md.

USPHS—young sanitary engineer with experience in sewage treatment procedures and familiar with routine tests, as B.O.D., in connection with sewage research program; job set up for a P-1 (about $2,300). The man will be stationed at a government hospital laboratory at Lexington, Ky., with inexpensive quarters and meals; no extensive background in sewage treatment needed as applicant will be sent first to the Stream Pollution Laboratory in Cincinnati to learn the procedures set up for this special project. Dr. F. J. Brady, Zoology Dept., National Institute of Health, USPHS, Bethesda, Md.

Sanitary engineers for National Biscuit Co., in junior grades. Address: J. L. Barron, National Biscuit Co., 440 W. 14th St., New York, N. Y.

Chicago Water Works, about 10 assistant water chemists and engineers in various grades, mostly lower professional. Address: John R. Baylis, Bur. of Engineering, Dept. of Public Works, 6843 Oglesby Avenue, Chicago, Illinois.

South and Central America, salaries ranging from $4,600 to $6,500, and with living expense allowance in addition. Write Colonel H. B. Gotaas, SnC., President, Office of Inter-American Affairs, 499 Pennsylvania Avenue, N. W., Washington 25, D. C.

USPHS—engineers needed, P-2 to P-6 rating for handling surplus sanitary engineering property. Write Lt. Colonel Carl H. Schwob, 2000 Massachusetts Avenue, N. W., Washington, D. C.

UNRRA, a sanitary engineer for 1 year foreign duty, $6,000; experience in supply. Write Dr. I. V. Sollins, UNRRA, Washington, D. C.

State Board of Health, 4 or 5 engineers—salaries $2,000 to $4,000. George L. Hall, State Board of Health, Baltimore, Md.

The Florida State Board of Health, engineer for proposed industrial hygiene section. Write Maj. David B. Lee, Chief Sanitary Engineer, Florida State Board of Health, Jacksonville, Florida.

The City of Lincoln, Nebraska, public health engineer, salary $3,300-$4,200 per annum, with transportation furnished or an allowance made for use of private automobile. Write Dr. L. L. Fatherree, Superintendent of Health, City of Lincoln Health Department, Lancaster County, Nebraska.

John R. Stubbins, the Oficinia Tecnia Stubbins, needs competent engineer in Venezuela; position permanent; salary $5,000 to $7,000 per year, depending on ability. This organization acts as exclusive representatives in that country for the Wallace & Tiernan Co., Roberts Filter Mfg. Co., and other important manufacturers of water works equipment. Write John R. Stubbins, Administrator, One Fifth Avenue, New York, N. Y.

W. H. Hammond, Now Vice President of Gar Wood Industries

Mr. Hammond was formerly sales manager of the hoist and body and tank divisions only and director of branches.

In his new position, he will supervise the sales activities of the winch and crane, road machinery, heating and boat divisions in addition to those formerly under him. He will continue as director of branches.

Mr. Hammond joined Gar Wood as a bookkeeper in its Philadelphia branch in 1921, shortly after his discharge from the Army. He was named manager of the Baltimore branch in 1925 and of the Boston branch in 1929. He came to New York in 1933 to head Gar Wood's activities here and assumed the position he has just vacated in January, 1934.

W. H. Hammond

Shaeffer Elected Vice President Gar Wood Industries

George D. Shaeffer, formerly chief engineer of Gar Wood Industries, Inc., Detroit, Mich., has been elected vice-president in charge of engineering.

Mr. Shaeffer joined Gar Wood in 1938 as chief engineer of its road machinery division, after having served as chief of the road machinery engineering department for Allis-Chalmers for two years. He is a graduate from Ohio Northern University and became chief engineer of the road machinery division of W. A. Riddell Company in 1924.

Geo D. Shaeffer

IT'S COMING!

THE NEW NO. 102 MOTOR GRADER

Galion

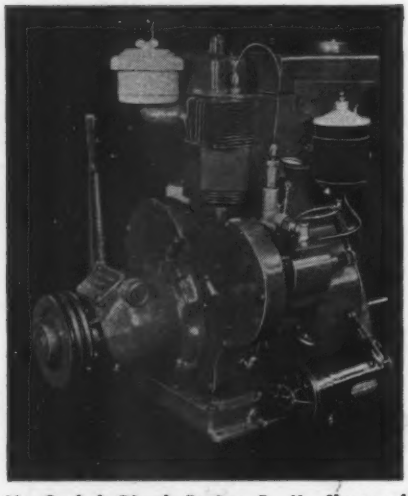
A new year is upon us. The picture has changed considerably during the past year. Having piled up an enviable war record, Galion enters 1946 with confidence . . . with a new line of motor graders and rollers. Bearing the well-known Galion name plate, these new models are worthy successors to our line of road machinery which has won so much confidence throughout the world. The Galion No. 102 motor grader, indicated above, is just one of the new heavy duty units to carry the Galion name, your guarantee of the best, in 1946.

THE GALION IRON WORKS & MFG. CO.
Main Office and Works • Galion, Ohio

PUBLIC WORKS Equipment News

3¾ H. P. Diesel Engine Is Air-Cooled

A new Diesel engine being built by the R. H. Sheppard Company of Hanover, Pa., is unique not only because it's the smallest Diesel ever built for commercial use . . . but also because it's the *only* stationary Diesel that is *air-cooled*.



Air Cooled Diesel Engine—R. H. Sheppard Company.

In spite of the intense temperatures created by the high ratio of compression inherent to all Diesels—the air-cooling is so efficient that a hand can be laid on the cylinder without discomfort while the engine is operating at full load. This cooling efficiency is accomplished by directing a fan driven stream of fresh air over the more than adequate cooling fins. The absence of a liquid cooling system reduces the weight and size of the unit—as well as the time required for servicing and maintenance.

Overall the engine stands 28½" high, 20¾" wide and 22½" long with crank removed. Because of its small size and portability, the Sheppard Company predicts wide use of it for powering communication systems, auxiliary lighting plants, pumps and other types of power driven equipment.

It is a single cylinder, 4 cycle Diesel . . . developing 3¾ H.P. at 1800 R.P.M. It has a 3" bore, 4" stroke. Piston speed is 1200 F.P.M. at 1800 R.P.M. Piston displacement is 28 cu. in. Standard governor regulation is 3½%. It is equipped with both hand and 12-volt electric starting.

An indication of its economical operation is its fuel tank. It holds 9/10th of a gallon. A standard Sheppard fuel injection system is used . . . the same one employed on all other Sheppard Diesels. Fuel consumption is ½ lb. per brake H.P. hour.

The engine—including power take-off and clutch—is complete, ready to operate when shipped from the factory.

It is also available direct-connected to a 2 K.W. generator with control box and rheostat.

The R. H. Sheppard Company will be glad to forward complete information on request.

Morse Boulger Acquires Chem-Feeds, Inc.

Morse Boulger Destructor Company, New York 17, N. Y., has purchased Chem-Feeds, Inc., Providence, R. I. and will carry on the business as the Chemical Feeders Division of Morse Boulger Destructor Company. Chem-Feeds, Inc., was started and developed by Jeff Corydon II, well-known in connection with the feeding and proportioning of chemicals. Mr. Corydon will head up this new division of Morse Boulger.

The outstanding feature of the Vari-Feeder, the company's principal product, is the control by speed.

The apparatus is capable of "Controlled" feeding of any wet chemical and against pressures where required such as Alum Feeding, Hypochlorination, Soda Ash Treatment, Caustic Dosage, Aqua Ammoniation, Swim Pool Water Treatment, Calgon for Corrosion Control.

To Cut Rubbish Collection Costs

Dempster Bros., Inc.
Knoxville 17, Tenn.

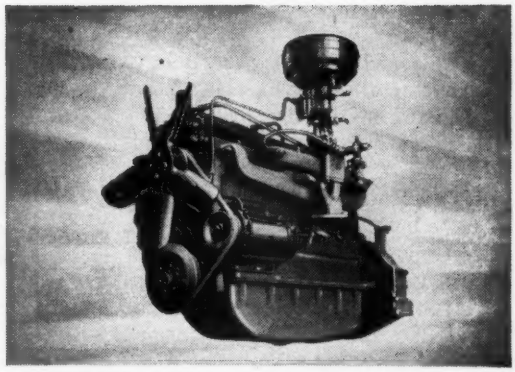
Designed to eliminate much heavy truck equipment and maintenance expense in rubbish and trash collection in cities and towns, Dempster Brothers announce the new Dempster-Kolector. Mounted on rubber tired wheels, trailer-fashion,

Dempster-Dumpster Kolector hoisted up on unit, put into carrying position and dumped all from driver's seat.

Ask G.I. Joe about GMC Pulling Power

On every battle front G.I. Joe saw proof of GMC's pulling power. In the South Pacific, in temperatures as high as 130 degrees, GMC "six-by-sixes" hauled huge loads through hub-deep mud and sand. In Europe, GMCs played the leading role on the famous Red Ball Express. In Alaska's ice and snow, Burma's jungles and Italy's mountain trails... wherever heavy loads were pulled through heavy going... GMCs did the job.

G.I. Joe knows about GMC pulling power . . . and what he can tell you is mightily important to truck buyers. For GMC commercial models, ½ to 20 tons, have engines of the same basic design as their military brothers. They offer the civilian counterpart of the power, performance and stamina demonstrated by nearly 600,000 GMC "Army Workhorses."



The famous "270" engine, power plant of the "Army's Workhorse," also powers GMC models in the 3-ton range. All other GMC gasoline engines are of the same basic, war-proved design.

THE TRUCK OF VALUE **GMC TRUCKS** **GASOLINE • DIESEL**

GMC TRUCK & COACH DIVISION • GENERAL MOTORS CORPORATION

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 71-73*

the new Kolector bodies are spotted for filling, then picked up when full by light trucks for the journey to disposal site.

It is claimed that with this new equipment one truck and driver can do the work of from 5 to 10 heavy trucks in rubbish collection. Illustration shows a filled Kolector in carrying position on truck. Features are said to be quick low-level loading, with minimum man-power requirement, and speedy maneuverability through alleys and other tight spots. Write Dempster Brothers, Inc., Knoxville 17, Tenn., for descriptive literature.

Harvester Buys Gigantic Melrose Park War Plant

International Harvester Company will use the former Buick aviation engine plant at Melrose Park, Ill., Chicago suburb, for expanded production of its industrial power line of products, has been announced by H. T. Reishus, general manager of the company's industrial power division. The greater portion of the plant's 1,200,000 square feet of manufacturing floor space will be used for the production of Diesel motors. These motors will power Harvester's line of crawler tractors, and others are sold to manufacturers of equipment who use the Harvester motors to power their machines. The plant will be known as the Melrose Park Works of the International Harvester Company.

The price paid by International Harvester for the Melrose Park Plant was $13,750,000.

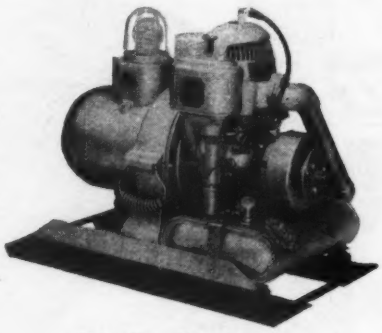
In addition to the line of Diesel motors, one 65-horsepower gasoline engine, one large new model of crawler tractor—the TD-24—and a full line of stationary power units will be made in the plant, Reishus said.

Reishus stated that the Diesel motors to be built at the plant will range in size from engines of 35-horsepower up to large units of 200-horsepower. The large new crawler tractor to be built at the plant will be the largest tractor of any type built by Harvester, with 130-horsepower at the drawbar and weighing 18 tons. This giant of the Harvester industrial power line will be added to its current group of four crawler tractor models ranging from 35 to 75 horsepower.

It is estimated that the plant, when Harvester gets it into full production, will employ approximately 5,500 men and women. Reishus expressed the hope that the company could begin this program within 60 days, and that the plant could be in operation sometime during the first six months of 1946.

Homelite Announces New Lightweight Generators

Production of two new gasoline engine-driven generators is announced by the Homelite Corporation, Port Chester, New York. De-



New Homelite Generator.

signed as a portable power source for electric tools, floodlights, radio, amplifying or motion picture equipment these units can be moved quickly to any location or job. They are ideal for emergency power or when power lines are inaccessible. Extremely portable, the Model 21D, a 2000-watt, 120-volt D.C. generator, weighs only 115 pounds. Both units have over-all dimensions of 22-3/8 x 17-1/8 x 21-1/8 inches.

Incorporating new design features developed for the Army and Navy and tested under actual combat conditions, these units are sturdy and dependable. The use of aluminum alloys for all large castings has permitted an increase in output without sacrificing portability. The single cylinder air-cooled two-cycle engine has only one valve, a rotary disc type, which is self-seating and requires no adjustment.

An improved Wico magneto gives a strong spark for easy starting. The engine speed is controlled by an automatic built-in governor. A pressure-vapor oil system sprays a film of fresh oil over all moving parts with each revolution. The generator is direct-connected to the engine, with the armature mounted on the engine crankshaft.

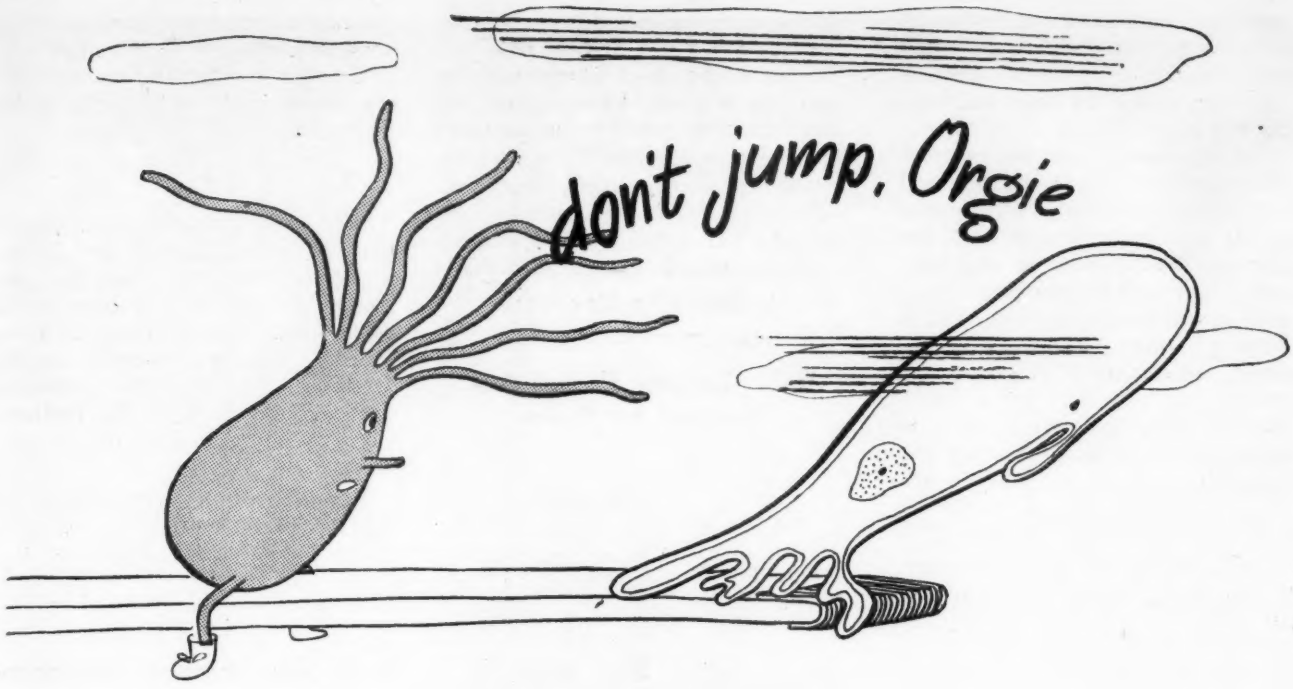
New Pulsing Control Drive Yardeny System

Yardeny Pulsing Drive provides single knob precision control of any type of reversible motor. Direction and extent of motor motion are under complete control of the single knob. The motor may be continuously rotated or moved in small increments—easily and accurately. Control action is as follows:

Slow clockwise rotation of the control knob results in a corresponding motor motion in small increments. Slow counter-clockwise rotation of the control knob causes reverse motor rotation in small increments. Either of the above operations permits the controlled mechanism to be spotted with the highest degree of accuracy.

Rapid rotation of the control knob causes faster motor motion and more extended travel. Therefore, the very

New International Harvester Plant.



that water's been treated with

PITTCHLOR

Pittchlor's minimum of 70% available chlorine is sure death to most harmful microorganisms, bacteria and algae. This high-test calcium hypochlorite is excellent for chlorination of water supplies . . . for the treatment of sewage . . . and for many other disinfection, deodorant and general sanitation tasks.

Easy and economical to use—packed in 5 lb. resealable cans (9 to the case) and 100 lb. drums. Carried in stock by leading jobbers.

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important features of fine and coarse control are incorporated in this single knob control.

By depressing the knob and turning the knob slightly right or left, continuous forward or reverse rotation of the motor can be accomplished.

The Yardeny Pulsing Drive works on all standard currents and frequencies. The extent of fine and coarse control provided by the unit can be made to suit every purpose in a manner that permits quick approach and precise positioning of the controlled object.

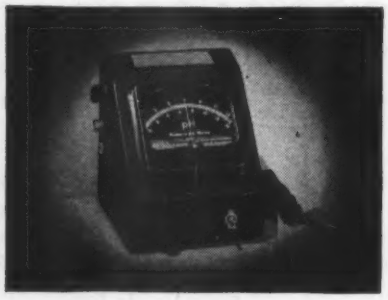
Yardeny Pulsing Drives are suitable for inclusion in all existing controlled motor devices and offer many advantages that recommend it for new design projects. Recommended applications include precision control of valves, flaps, cranes, lifts, rollers, mixer, etc., in fact any motor-driven equipment requiring more precise and more flexible control than is afforded by ordinary push-button methods of control.

The unit will be demonstrated by appointment.

Control Unit is a product of Yardeny Engineering Company, 105 Chambers Street, New York 7, N. Y.

A New pH Meter

The extreme simplicity of operation of the Macbeth line-operated pH Meter will make possible the use of adequate pH control in many operations, which up to the present time is not performed due to the high cost and complexity of existing pH meters.



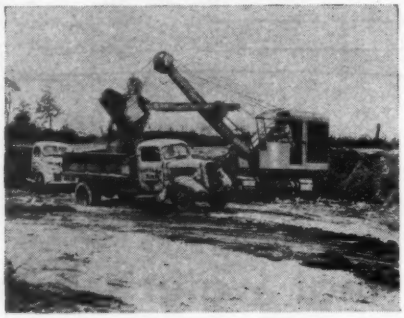
Macbeth pH Meter.

The new Macbeth line-operated pH Meter can be used by workmen, and assistant technicians as well as chemists. It possesses exclusive unique features that reduce to the minimum experience necessary for obtaining pH readings. Only one control in addition to the electrode switch is used, greatly increasing the number and type of workers who can easily operate the pH Meter. pH values are read directly on the scale in .1 units over the full range of 0-14 pH.

Since no batteries whatsoever are used, the Macbeth line-operated pH Meter can be left on continuously. This new meter will be sold only through laboratory supply dealers. A bulletin describing the Macbeth line-operated pH meter may be secured from the Macbeth Company, 227 W. 17th St., New York 11, N. Y.

New Crawler Shovel Announced by Byers

A comparable model to Byers "Traveler", recently announced half yard shovel on self-propelled, one-man-operated, rubber tired chassis, is Byers Model 61, a half yard excavator on crawler mounting. This is the second new shovel and crane announced by The Byers Machine Company this year.



New Model Byers Shovel

Model 61 embodies many of the same design features as the "Traveler", including full ½ yd. capacity, Airflex finger tip air clutches, gears enclosed and running in forced circulating oil, wide and large tandem drums and new patented worm type boom hoist. In numerous ways, the upper deck machinery, cab and attachments are the same as and interchangeable with the "Traveler" model.

All main frames are of welded and bridged rolled steel construction and crawler base of the model 61 is 10′-8″ long and 8′-0″ wide. The 18″ wide treads are self-cleaning, non-clogging and roller chain driven. Wider, longer crawlers are available for soft ground travel and for crane and dragline work.

Clutches for steering crawlers to left or right are engaged by the same air pressure that is employed to engage upper deck friction clutches. Crawler steering controls are handy thumb operated latches, conveniently banked with other levers, that may be operated at will while travelling without arresting the forward or reverse movement of the machine.

Crawler steering and check brakes are automatically set by spring action when clutches are disengaged.

Upper deck revolves on four large, tapered hook rollers.

Model 61 embodies the popular feature of being able to hoist, swing, travel and steer at the same time. Together with the new medium speed boom hoist, which also may be operated at will, this machine is expected to appeal to crane and clamshell users, according to P. T. Redforn, General Sales Manager of the company.

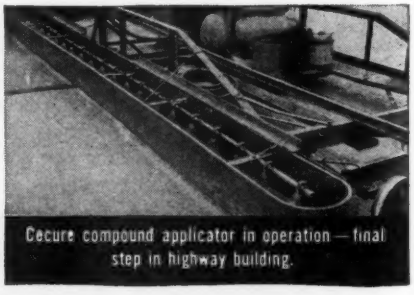
Complete catalogs describing the Model 61 are available by writing to The Byers Machine Company, Ravenna, Ohio.

Ceco Steel Products Corporation Services to Highway Builders

It permits obtaining all the steel material needed on a job on one order delivered as wanted and on time.

The Ceco products consist of welded wire fabric, reinforcing steel, metal center strips, transload devices, dowel bars, stake pins, dowel bar supports, expansion joints, dowel bar sockets, Cecure curing compound and sub-grade paper.

Ceco provides the following services: 1. Accurate pre-bidding information. Ceco takes the guesswork out of bidding by supplying accurate data which helps the contractor prepare accurate estimates for complete bids. 2. Blueprints of engineering details. Ceco engineers do the detail work for contractors in supplying all engineering data on reinforcing and other materials such as curing compound. 3. Applicator for Cecure curing compound. Ceco makes its applicator available to contractors using Ceco road building materials. Full details will be furnished upon request to the Corporation, 5703 W. 26th St., Chicago 50, Ill.



Cecure compound applicator in operation — final step in highway building.

Ceco Applicator.

SERVICE.. FOR THE WORLD'S FINEST WATER SYSTEMS

Anywhere
Any Time

When the call comes for repairing, servicing or the reconditioning of a Well Water System, Layne goes into action with every type of modern equipment used by the industry—plus the largest and most thoroughly trained crews ever assembled. And as an extra advantage, these men have for guidance a completely detailed plan or record of every well and pump installed by Layne. This is the kind of service that adds so much plus value to the choice of a Layne Well Water System.

Every owner of a Layne Well Water System or a Layne Vertical Turbine Pump can always be assured of efficient repair service with a minimum loss of time—and at minimum expense.

If your Well Water System is in need of repairs or should be reconditioned to produce more water, write, wire or phone for service information. If you are considering a new water system, ask for late literature. Address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

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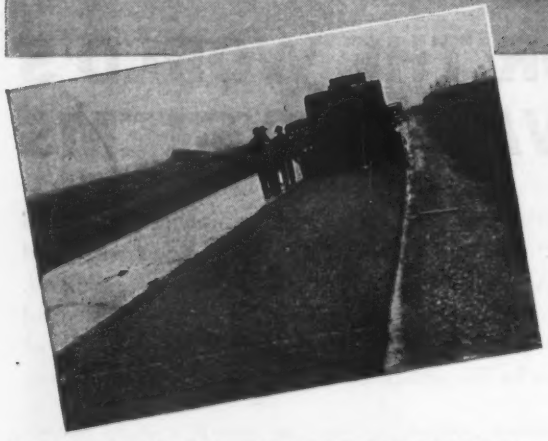
WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

When you need special information—consult the classified **READER'S SERVICE DEPT.**, *pages 71-73*

Here it is . . . The New . . .

MOTO-PAVER



Resurfacing a Michigan Road with the Moto-paver

An Entirely Self Contained, Self Propelled Asphalt Mixing and Laying Machine

Mixes, Spreads and Lays Any Type of Mixed-in-place Bituminous Material to Any Road Width, Thickness and Crown Condition.

Hetherington & Berner Inc., America's first builders of asphalt mixing machinery, proudly present the Moto-paver—the last word in asphalt mixing and laying equipment. This highly flexible and mobile machine is a complete traveling asphalt mixer and paver, requiring no separate loader, spreader or other paving equipment, and no trailer to haul it from one job to another. The Moto-paver is mounted on pneumatic tires, and powered by two gasoline engines, one driving the mixer and related units, the other driving the machine along the road. Paving speed is from 4 to 50 feet per minute, road speed 15 to 18 miles per hour. Mixing capacity is 100 to 120 tons per hour.

The Moto-paver mixes and lays all but the highest types of bituminous concrete. It is especially suitable for resurfacing trunk roads and streets of smaller municipalities, but it is also an efficient unit for new construction work on roads, streets, airports, parking lots, driveways, etc.

Write for bulletin MP-46, which gives complete information and specifications.

HETHERINGTON & BERNER INC. • 729 KENTUCKY AVE. • INDIANAPOLIS 7, IND.

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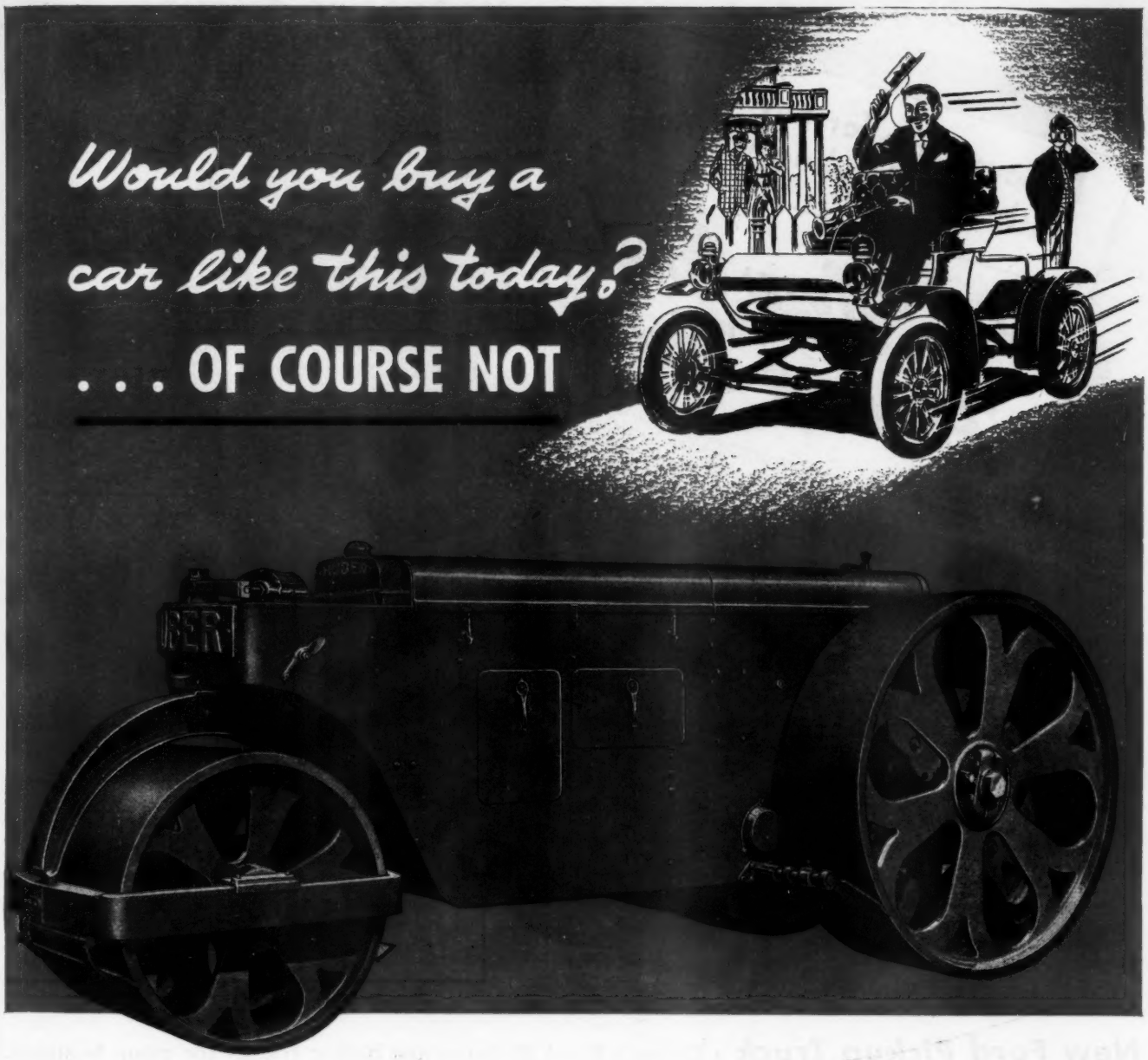
America's First Builders of Asphalt Mixing Machinery



Just as 1946 motor travel calls for a modern automobile, today's construction job demands an up-to-the-minute roller— a HUBER HEVI-DUTY. Rugged, heavy solidness for the toughest punishment plus power and speed to spare — that's the HUBER HEVI-DUTY, available in 10 and 12 ton sizes. Let us tell you the whole story.

THE HUBER MFG. COMPANY ● MARION, OHIO, U. S. A.

HUBER ROLLERS

When you need special information—consult the classified **READER'S SERVICE DEPT.**, *pages 71-73*

TWO GREAT FORD ENGINES

The 100 H.P. V-8 • The 90 H.P. Six
Three-Quarter-Floating Rear Axle

BODY DIMENSIONS: Length 78¾ inches • Width 49 inches • Height 20.22 inches • Loading Height 23.73 inches • Load Space 45 cu. feet

New Ford Pickup Truck • Today's Ford Pickups are better trucks for *your* business. They're better trucks for *any* business. Exclusive Ford features and advancements make them roadworthy—streetworthy—farmworthy. Look below. You'll find advantages only Ford can offer—reasons why, year after year, registrations show "More Ford Trucks on the Road!"

MORE ECONOMICAL, MORE RELIABLE, MORE ENDURING THAN EVER!

TWO great engines—the rugged 100 H.P. V-8 with a score of important engineering advancements, or the 90 H.P. Six, for jobs that call for economical stop-and-go driving. Truck-type frame. Side-mounted springs. Three-quarter-floating rear axle with straddle-mounted pinion and 4-pinion differential. Four double-action shock absorbers. Note the generous dimensions of the heavy-gage steel Ford Pickup body, shown above—45 cubic feet of load space—wide enough for easy flat-loading of such 4-foot units as plywood or plasterboard (no wheel housings). Floor is heavy-gage steel-surfaced, with formed skid-strips and hardwood under-flooring. Tailgate, strong and rattle-free, swings full-down for loading.

Priorities No Longer Needed. Ford **See Your Ford Dealer!** **FORD TRUCKS**

When writing, we will appreciate your mentioning **PUBLIC WORKS**

PUBLIC WORKS Magazine . . . January, 1946

VOL. 77. NO. 1

Special truck used in Manchester, N. H., for spreading rock salt. The plank sloping down to the spreader hopper saves much labor in handling the 100 lb. bags of salt.

Use of Rock Salt for Removing Ice and Snow From Streets

Officials of several cities tell briefly the methods and equipment used by them in applying this material and the results obtained.

STREET officials who have used rock salt for removing snow and ice have recently been questioned by the International Salt Company on their methods of applying this material and the results obtained. The replies from a number of the officials will, we believe, interest most street officials and possibly give suggestions to some who already are using this material.

Describing the procedure that is followed in Cleveland, Ohio, in salting streets, Miles E. Evans, former Director of Public Service in that city stated: "We found that if we can get our salt trucks out and busy right at the start of a storm, we can save many weary hours of plowing, scraping, shoveling and trucking snow later on. The reason is that, if the storm turns out to be a light one, our early spread of rock salt will, in many cases, melt it away completely. If the storm is severe, with a heavy fall of snow, the work of the plow crews is made just that much easier because the rock salt crystals bore down into the snow or ice, break it up and keep the snow from packing down and bonding to the pavement surface, so that one pass of the plow can remove it."

Stressing the importance of winter driving safety, Carl D. Warner, Superintendent of Sanitation in Detroit, Michigan, recently wrote: "Use of rock salt has made it possible for us to combat snow, ice and freezing rains instantly and to keep them from packing into frozen slush deposits and glare ice surfaces. Because of that, skidding and collisions, of course, are enormously reduced; men and materials get to and from plants without delay; and Detroit saves money and man hours in highway maintenance in spite of the rising costs. We were able last winter to keep Detroit's streets free of snow and ice in spite of the most severe storms. Come what may this winter in snow and freezing rain, we expect to do it again."

Superintendent of Streets, Edward F. Morgan, Jr. wrote that, in Hudson, Massachusetts, "we give top priority to snow removal in front of our churches, cemeteries and homes where there has been a death in the family. As soon as the snow begins, our men go out and spread rock salt on the sidewalks and streets at these points and plows follow as promptly as possible. You'd be surprised what a good impression such thoughtfulness creates."

Napoleon Sevigny, City Surveyor of Manchester, New Hampshire, related that "aside from the all-important safety angle, however, and in addition to making it easier for workers to get to their jobs and children to their schools, we have found that rock salt

Truck in Newark, N. J., spreading rock salt.

is very useful during the cold months in another way —to help maintain road and street repair work. We use it to keep the ground from freezing whenever it is necessary to do any digging, drilling holes and filling them with rock salt to keep the earth soft. We also throw rock salt in with the excavated soil to keep it pliable in order that the excavation can be refilled easily. Used in these ways as an anti-freeze, it saves time and money and simplifies road maintenance and ice removal work throughout the winter."

George C. Stanley, City Engineer in Burlington, Vermont, pointed out another advantage of using rock salt which he had discovered. The salt, he said, had made possible the elimination of abrasives in the business section, a fact which represents a saving for the city because in past years great quantities of sand had to be spread at frequent intervals to keep the snow and ice from becoming too slippery. "Since the cost of a sand spreading is about the same as a salt application, and the salt requires merely a single treatment to secure bare pavement, expenses have been cut. Another saving will be effected because it will not be necessary to clean out catch basins and drains, which previously became clogged by abrasives. Salt is completely soluble."

Cities like Cleveland, Detroit, Providence and others furnish at no cost boxes of rock salt at important intersections, dangerous grades and hills and underpasses, for the use of motorists in case they get stuck before the department's trucks can reach those sections.

In Detroit these rock salt boxes are placed at important intersections and crossings for use as needed.

In Cleveland the practice is to "set out more than 100 boxes every year at the beginning of the winter season. The boxes are unlocked and their contents are available for use in emergencies. In addition, we place stockpiles of the same material throughout the city where it is likely to be most needed. We ask the police and the public, in cases of emergency, to use these materials and to spread them on slippery or icy spots, which temporarily relieves any dangerous condition until it can be taken care of by the regular crews." Detroit sets out about "400 rock salt boxes at intersections and underpasses for use by motorists and police and at all school crossings as a safety measure so that traffic can stop quickly."

James A. Robinson, Superintendent of Streets in Portland, Maine, in his review, summed up for the commissioners when he stated, "The public has an important stake in thrifty snow removal operations as reflected in rates and taxes. In our highway and road computation, rock salt clearance means lower costs as well as a quicker and more thorough job. All told, our ten year experience with rock salt has been so good that we are planning to rely more heavily than ever on it this year as an important labor and money saver."

St. Louis Plans 35 Airports

An airport plan for the St. Louis Metropolitan area has been prepared by Horner & Shifrin and Harland Bartholomew & Associates. Based on expected air traffic and the number and type of airports that are expected to be needed in 1950 and 1960, the plan proposes a total of 35 airports. Of these, three are major airfields and one is a secondary field; 15 are minor fields; 13 are for local use; and three are congested air fields. It is recommended that 25 fields be located in Missouri and 10 in Illinois. The plan has been prepared in four parts; the first reviews existing facilities and estimates future air traffic; the second discusses factors considered in preparing the plan; the third is the plan; and the fourth considers some cost data estimates.

Sound Film of Construction Accidents

A recently produced sound film devoted to accident prevention has just been released by the National Safety Council. Covering most of the occasions and many of the causes leading up to accidents connected with the use of construction equipment—such as bulldozers, cranes, tractors, cats, steam shovels, dump trucks and similar machinery—it illustrates the few simple rules generally applicable and which, if followed, would be effective in accident prevention.

During 1944, approximately 1,800 workers met death on construction work. While such work engages only 2% of the nation's total workers, the fatality list represents 10% of the deaths in the entire industry of this country. It is 4½ times greater than the average rate of all industrial groups.

As a document supplementary to the film, the council has prepared a manual that can be used in group discussions on accident prevention following showings of the film. Further information on this film may be obtained from the National Safety Council, Inc., 20 N. Wacker Drive, Chicago 6, Ill.

View of upper face of dam, showing rip-rap paving.

Water Storage and Filtration for a Small Village

A village of less than two thousand population is provided with filtered water, obtained from three sources to guarantee against failure of supply.

By WALTER W. GRAF
Walter W. Graf & Associates, Consulting Engineers

CORNING, OHIO, is a village in the southeastern part of the State with a population of 1433 persons at the time of the 1940 census. It is principally a railroad and coal mining center.

The first public water supply was installed in 1894. The supply was obtained from a small impounding reservoir with a wholly insufficient watershed, which was distributed through approximately 1¾ miles of 4" pipe with no circulating mains. The water was untreated and unfit for domestic purposes, and served but approximately forty consumers.

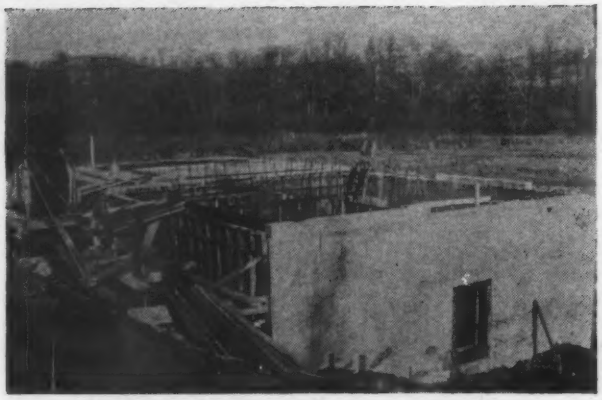
In 1937 the village, with the aid of WPA, developed a well supply, small in quantity and only fair in quality, and added approximately 5 miles to the distribution system. By the spring of 1944 the number of consumers had increased to over 200, with applications for additional services on file that could not be installed on account of lack of water supply. Additional wells were drilled, but no additional water was obtained.

During the fall and winter of 1943-1944, for a period of several months, the consumers were supplied with water for only about six hours each day, and some consumers at the higher elevations were without any water service for periods of days. At that time the writer was called in for a conference with the Mayor, Board of Public Affairs and Village Council; following which, he was employed to prepare plans and specifications for the construction of a reservoir to store a surface supply, and for a filtration plant.

A survey was made of the possible sources of supply, and after conferring with engineers of the Ohio State Department of Health, village officials and land owners, it was decided that the most satisfactory and economical location for an impounding reservoir was in a ravine on a branch of Dodson's Creek, near the site of the existing wells. It was possible to provide a storage reservoir here with a capacity of approximately ten million gallons, without a large expenditure of money for land and flood rights. Also the location permitted the erection of a filtration plant near the existing line which connected the wells and the distribution system.

This location makes possible an exceptionally flexible system of supply. The filtration plant is located about 250 ft. southeast of the reservoir, from which the water flows to it by gravity. About 200 ft. south east of the filtration plant is Dodson's Creek, at about ten feet lower elevation, from which low-service pumps located in the plant can draw water through an 8" cast-iron suction line and discharge it either into a retention basin at the plant or into the impounding reservoir. The existing wells are retained as a third source of standby or supplemental supply.

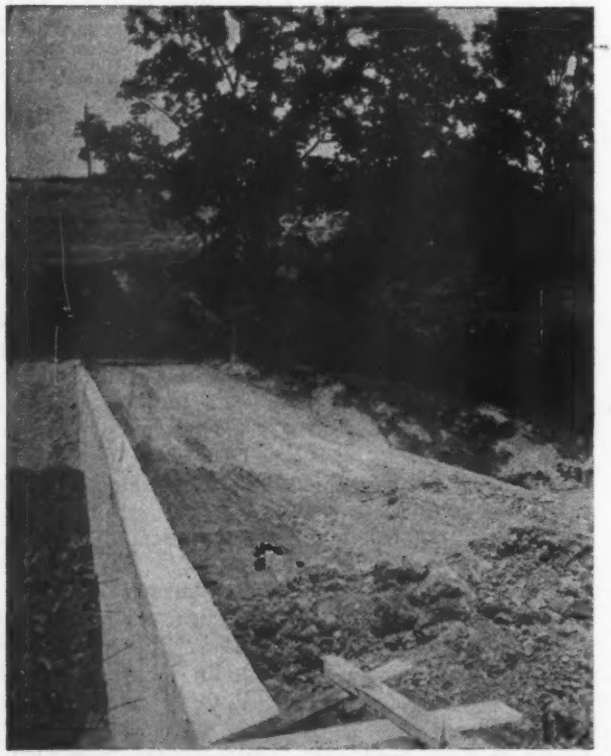
The design contemplates the use of water by gravity from the limited drainage area above the impounding reservoir during the wet seasons of the year. When water ceases to run over the spillway of the dam, the 10 million gallons of stored water will be retained for dry-weather use, and water will be taken from Dodson's Creek, to provide for the regular supply and



Filtration plant under construction.

also to be pumped into the reservoir to make up for evaporation and seepage and keep the reservoir filled. Dodson's Creek has a drainage area above the plant site of approximately 6 square miles, and will maintain a flow for approximately nine or ten months in the year. During the two or three months of the year that this creek is dry, the supply will be taken from the storage reservoir, with the wells as an additional supply.

The impounding reservoir, which has been completed, was formed by the construction of an earth dam with a concrete core across a narrow valley between two rather steep slopes. The dam has a maximum height of 28 feet, providing a maximum depth of 24 feet of water with a free-board of 4 feet. The concrete core extends below the natural surface into the rock, which was found at a maximum depth of 15 feet below the existing surface. The up-stream face of the dam is paved with rip-rap obtained on the site. One hundred feet of the spillway is paved with reinforced concrete and the remainder is cut into the rock side slope of the adjacent hill.



Earth dam under construction, showing concrete core wall.

The filtration plant is designed to supply 200 gallons per minute to service and will require about 4 hours per day operation to handle the present demand.

The influent to the plant (from one or more of the three sources of supply), after flowing over a plate aerator, is discharged into a rapid-mixing basin which is equipped with a Type S-1 "Lightnin" mixer, a Jeffrey 1-B reagent feeder, and a Bacharach F-259 dry chemical feed machine. From here the water flows into a slow-mixing basin equipped with a Bacharach T-100 mechanical agitator; thence into a settling basin with a 4-hour retention period. The water is then passed through two gravity-type sand filters, 7 feet square, equipped with Leopold fire-clay underdrains and Palmer surface washers; thence to the clear well and to service. Simplex rate-of-flow controllers, Simplex gauges and Weinman pumps are being installed.

Owing to the difficulty of obtaining materials and equipment and the skilled labor shortage, the progress on the job has been slow. However, it is expected that the plant will be ready for operation early in 1946.

The plant was designed and is being constructed under the supervision of Walter W. Graf & Associates, Consulting Engineers, Lancaster, Ohio. Walter J. Elliott of McConnelsville, Ohio, was the contractor on the earth dam and reservoir. C. W. Taylor & Son of Zanesville, Ohio, are contractors for the filtration plant and Geiger Brothers of Logan, Ohio, for all piping and the installation of the equipment.

Method for the Detection of Indole

A quick chemical test for detecting the presence of E. Coli, described by Jacobs and Pincus,* shows promise of usefulness in water testing laboratories as an alternative to the bacteriological methods currently employed. The method described yields favorable results in four to five hours by taking advantage of the indole-producing characteristics of E. Coli.

The most widely used test for the detection and determination of indole is its reaction with p-dimethylaminobenzaldehyde. However, this test, as such, has the disadvantage of being not specific for indole, nor is it sufficiently sensitive. These disadvantages are overcome by extracting the indole from a culture with chloroform. The indole is then detected by adding a reagent composed of trichloroacetic acid dissolved in chloroform, p-dimethylaminobenzaldehyde and concentrated hydrochloric acid, and holding the test mixture in warm water (50° C) for 0.5 minute. The presence of indole is indicated by a pink to a rose or red color.

The quantity of indole is measured in a colorimeter tube by comparison with known standards treated in the same manner. The color reaction with the testing reagent mentioned above fades out rapidly with low concentrations of indole. In such cases a less stable reagent is used containing the same chemicals except that the hydrochloric acid is replaced with 0.5 ml of acetic anhydride and 2 drops of concentrated sulphuric acid. The test can detect the presence of indole in quantities as low as 1 part per 100,000,000.

Experiments were run on cultures of E. Coli and the test gave positive results in 7 out of 8 cases at the end of 3 and 4 hours of incubation, and in the 8th case at the end of 24 hours incubation.

*"Method for the Detection of Indole," by Morris B. Jacobs and Sol Pincus, Dept. of Health, City of New York. *Science*, Vol. 102, No. 2643, page 204.

A Percolating Filter Plant for Universal Operation

Suggestion of an English engineer for designing a treatment plant that can be operated as a standard percolating filter, by alternating double filtration, or by recirculation of various proportions of effluent.

WHILE the exact value of either alternating double filtration or recirculation for treating any particular sewage has yet to be determined, the success of these methods in reducing BOD has been proved, and there is little question that they will be used considerably in future in those circumstances where BOD reduction is of most importance. It therefore follows that, in the design of sewage treatment works, the advisability, or at least the possibility, of using one or other of these methods will in the future have to be considered; and even if new works are not initially designed to function according to either one or other of these innovations, they should be so constructed that conversion is facilitated.

The above is quoted from the introduction of an article by L. B. Escritt, an English engineer, published in a recent issue of *The Surveyor*. He proceeds to describe in detail a plan proposed to afford "universal operation" in treating the sewage of a town of moderate size, and several methods of operating it. His description, somewhat condensed, is as follows:

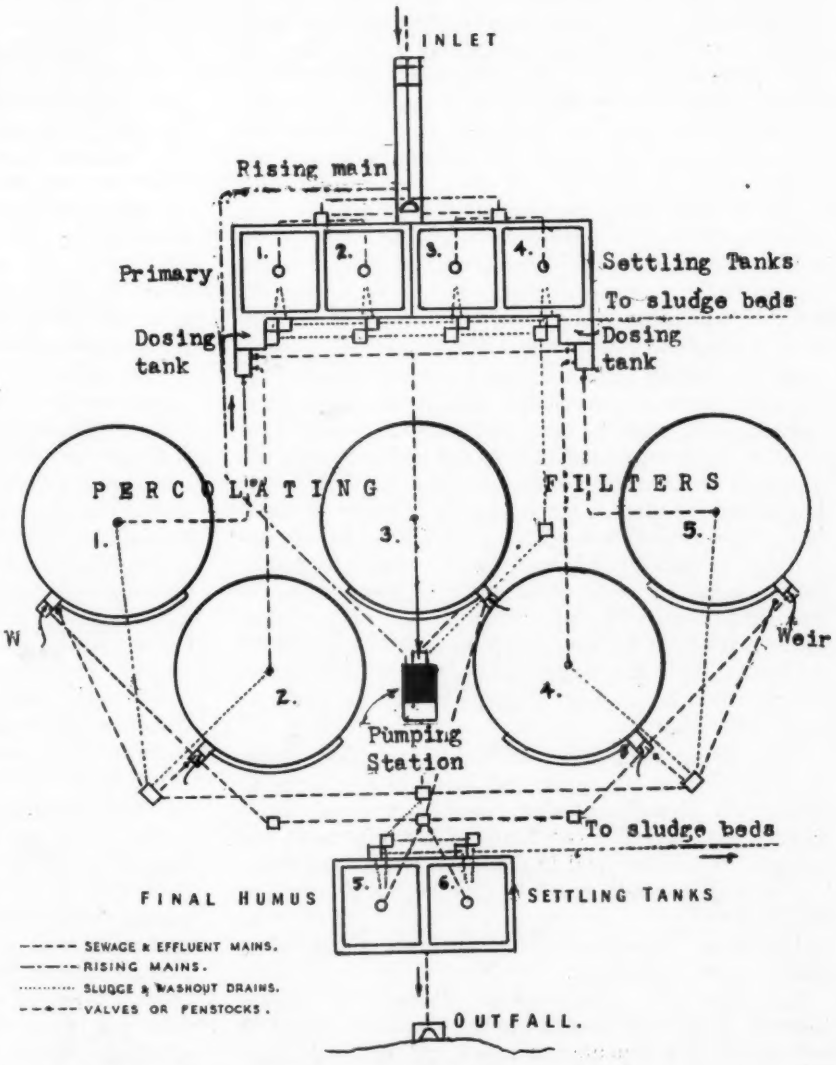
The principal features of the plant are: four sedimentation tanks; five percolating filters, one of which is a standby normally at rest; two final settling tanks; and a pumping station. Provision for treating the sludge is not involved in the operations described; it would, however, of course be included in the general plan; together, perhaps, with provision for returning digestion supernatant to the sedimentation tanks. Screens and grit chambers, also, are not considered although they may be included in the complete plan.

The four sedimentation tanks proposed by the author are hopper-bottom semi-upward flow tanks with central inlets and peripheral weirs, "designed with suitable inlets and correctly chosen surface areas and length of outlet weirs to give adequate settlement of either raw sludge or humus when each individual tank is passing three times the total dry-weather flow. Together they should be capable of storing the amount of sludge likely to arrive at the works in one week. All four tanks should be alike in design."

(It would hardly be considered good practice in this country to permit sludge to collect for a week in a sedimentation tank. Removal of sludge at least once a day by mechanical means has been the approved method here for several years.)

There would be two dosing tanks, each receiving the effluent from two of the sedimentation tanks and feeding two of the percolating filters. Also each dosing tank would be connected to the fifth filter, so that any of the five filters can be out of commission or the number in use at any one time can vary from one to five.

"The filter sparges (distributor) to each bed would be designed to pass the maximum rate of flow to the



Layout of percolating filter plant adaptable for various methods of operation.

works. To accommodate this somewhat high rate of discharge, the area of the beds should be judiciously chosen, and this would influence the depth of the filters within reasonable limits.

"The effluent from each individual filter would be collected to a separate sump. Each sump would be provided with a weir discharging to final humus tanks and thence to the outfall, and also a penstock or sluice valve and pipe line discharging to the pumping station. With the valve open, the whole of the flow from each filter would pass to the pumping station. With the valve closed, the effluent would back up in the sump until it passed over the weir and thence to the final humus tanks and outfall. The washouts from the filter feed pipe would discharge to the pumping station.

"As the final tanks serve purely for the purpose of intercepting humus, they could be designed accordingly. Also, they would not need to accommodate any flow greater than the maximum rate of flow of sewage to the works. These tanks would be provided with sludge pipes discharging to the sludge beds, and arrangements would also be made for the discharge of humus to the pumping station, the decanting of top water to the pumping station, and, if practicable, the complete emptying of the tanks.

"The pumping station would have as deep a sump as practicable, so as to make possible the complete emptying of all tanks on the site. It might, however, not be economical to include the final humus tanks in this service. As the pumps have only to deal with filter effluent, except on the rare occasions of washing out the sedimentation tanks, they would be comparatively efficient small 'dirty water' pumps, and for the best working of the plant the pumping station should consist of a number of pumps, all of equal size and arranged to cut in automatically one after another with the aid of electrically operated float switches, the first pump to cut in being the last to cut out." (It is, we believe, considered in this country to be good practice to provide for automatically alternating, each time, the order in which the pumps are cut in, so that all will have as nearly as possible uniform wear).

"The pumping station should be capable of delivering three times the maximum rate of flow of sewage to be treated, when at least one pump is acting as a standby. It is suggested that in the ordinary case the minimum number of pumps required to deliver the flow would be three, each having a capacity of three times dry-weather flow—i. e., four pumps in all, including the standby. If, however, it is not intended to use the works for recirculation at a greater rate of return effluent than one of effluent to one of incoming flow of sewage, the net pumping capacity could be reduced to half the above figure, and with balanced flow it would be an advantage to be able to pump at much lower rates.

"The rising main from the pumping station would be bifurcated at its upper end so as to discharge to either pair of sedimentation tanks as required, or to all tanks at once. The two limbs of the bifurcated rising main would be equal in diameter, length and number of similar bends, so as to give an equal distribution of flow."

The author describes several methods of operating such a plant as follows:

Operation as Straight-Run Percolating Filter Scheme. Flow from detritus tanks would be passed to both pairs of sedimentation tanks and thence to both dosing chambers. One percolating filter could be put out of action by closing the valve on its feed pipe, the remaining four being fed, two from each chamber. The valves on the effluent sumps on all the percolating filters would be closed, forcing the effluent over the weirs to the final humus tanks, from which it would gravitate to the outfall.

The sludge from all the sedimentation tanks would be discharged from time to time to the sludge treatment unit. The humus from the final humus tanks would be discharged either to the sludge treatment unit or, with the aid of the pumping station, returned to the flow of sewage and resettled with raw sludge in the sedimentation tanks. Apart from this service, the pumping station would deal with all wash-out flows and, if required, with returned sludge liquor.

Operation as Alternating Double Filtration Scheme. The flow from the detritus tanks would be passed to two sedimentation tanks only and via one dosing chamber to two percolating filters. The valves on the outlet sumps of both these percolating filters would be opened, permitting gravitation to the pumping station. The effluent would be lifted by the pumping station to the second pair of sedimentation tanks, which would then serve as primary humus tanks. From these the settled effluent would pass through the second dosing chamber to the second pair of filters. The valves on the outlets of the second pair of filters would both be closed, forcing the effluent over the weirs and on to the final humus tanks, and so to the outfall. The function of each pair of filters and primary tanks would be interchanged as desired.

Operation as Recirculation Scheme; Effluent Returned in Equal Quantity to Rate of Flow of Sewage. Sewage would be passed from the detritus tanks to both pairs of sedimentation tanks and both closing chambers, and fed to four of the five filters. The valves on the outlet sumps of any two of these four filters would be opened, permitting recirculation of effluent. The remaining two valves would be closed, causing discharge of treated effluent to the outfall. This should give recirculation of one part of effluent to one part of sewage with reasonable accuracy.

Operation as Recirculation Scheme; Effluent Returned in the Proportion of Two Parts Effluent to One Part of Incoming Sewage. Sewage would be passed from the detritus tanks to both pairs of sedimentation tanks and to both dosing chambers in equal proportions. The flow from one dosing chamber would be passed to three of the filters, two of which would be arranged to discharge to the final humus tank, the remaining one discharging to the pumping station. Flow from the other dosing chamber would be passed to two filters, both discharging effluent to the pumping station. Thus, two-thirds of one-half the flow, which is, of course, one-third of the whole of the flow coming from the sedimentation tanks, would be passed to the outfall, which means that the rate of recirculation would be in the proportion of two of effluent to one of incoming sewage.

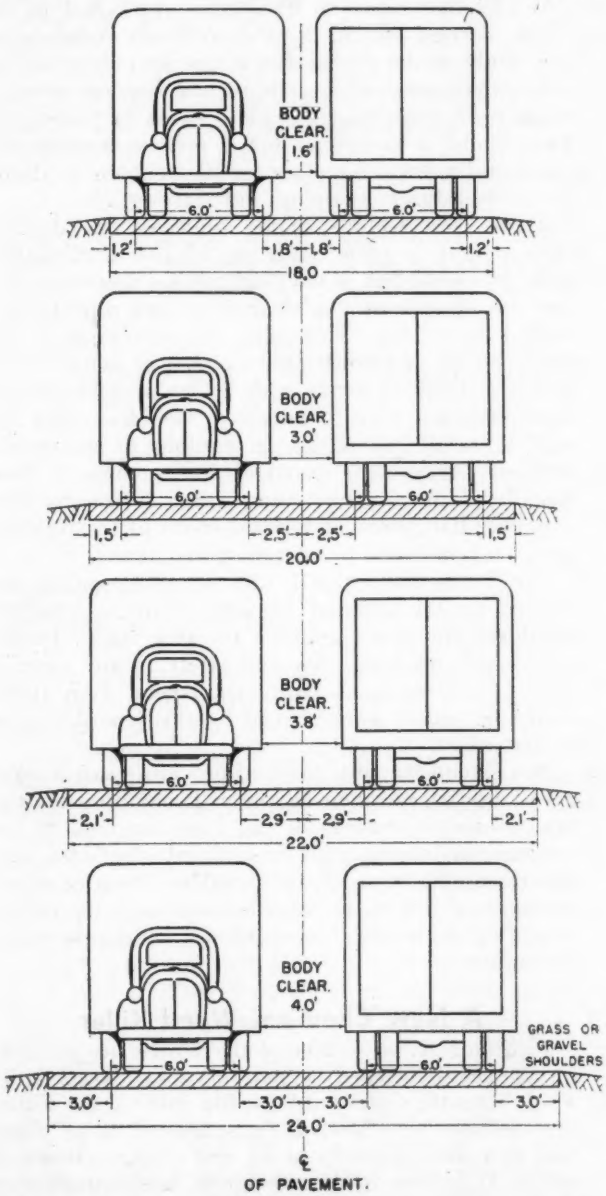
Operation as Recirculation Scheme; Effluent Returned in the Proportion of Three Parts Effluent to One part of Incoming Sewage. Sewage would be passed from the detritus tanks to both pairs of sedimentation tanks and both dosing chambers and fed to four of the five filters. The valves on the outlet sumps of any three of these four filters would be opened, only one being closed. This would give recirculation of effluent at the rate of three parts effluent to one of incoming sewage.

Relation of Width of Paved Roadways and Surfaced Shoulders to Safe-Highway Operation

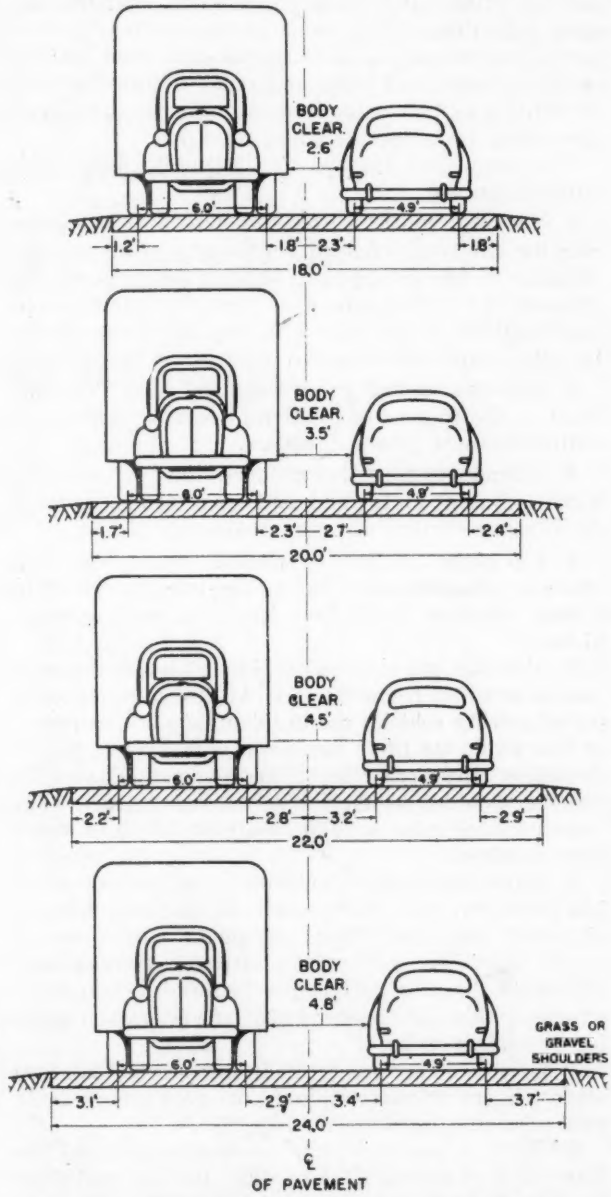
Studies by the Public Roads Administration have led to the conclusion that use of shoulders and danger of traffic accidents increase rapidly as pavement width decreases below 22 feet, and that 24 feet width is desirable.

THE Public Roads Administration conducted studies in ten states during the years just preceding the war to determine the placement of traffic on paved surfaces of country roads of various widths. A report presenting the complete analysis of all the collected data in these studies on straight level sections of two-lane concrete pavement, together with the conclusions drawn, has been published in the ~~July-August-September~~ Oct-Nov-Dec 1945 issue of *Public Roads*.

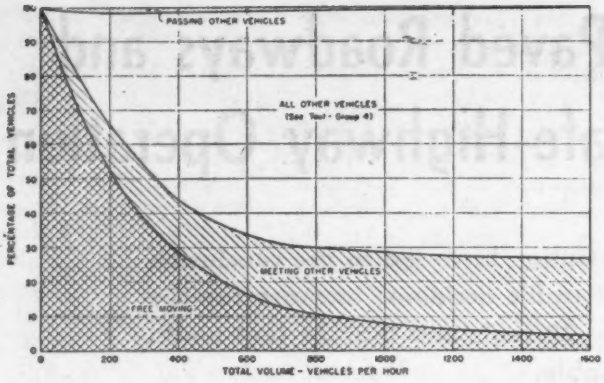
During the analysis of the data, a large number of tables and graphs were prepared showing frequency distributions, mean and standard deviations, and other



Average position of commercial vehicles when meeting commercial vehicles on two-lane concrete pavements during the day.



Average position of passenger cars and commercial vehicles meeting on two-lane concrete pavements during the day.



Distribution of vehicles by free-moving, meeting, and passing groups on two-lane concrete pavement with traffic evenly distributed in each direction of travel.

statistical measures pertaining to the variation in speeds and tranverse placements of vehicles under various conditions. These tables and graphs were used in arriving at the conclusions but are omitted from the report, the discussion being based primarily on average values. It is believed, however, that the frequency distributions of vehicle placements may be useful in determining slab thickness and cross section, shoulder width and type, and other design features, in addition to their value in determining required surface width for a specific traffic condition.

The conclusions reached by the Public Roads Administration are:

1. Shoulder width in excess of 4 ft. does not influence the effective pavement width for moving vehicles when there are no vertical obstructions immediately adjacent to the shoulders. This must not be interpreted that shoulders wider than 4 ft. may not be necessary for other important reasons.

2. Well-maintained grass shoulders have the same effect on the transverse position of moving vehicles as well-maintained gravel shoulders.

3. Bituminous-treated shoulders, 4 ft. or more in width, adjacent to 18- and 20-ft. pavements, increase the effective surface width approximately 2 feet.

4. Lip curbs on 20-ft. pavements reduce the total effective pavement width during the day approximately 1 foot. At night this is true only for commercial vehicles.

5. Shoulder use increases rapidly with a decrease in pavement width below 22 feet. An insignificant number of moving vehicles use the shoulders on pavements of that width. On 18-ft. pavements with grass or gravel shoulders, however, 5% of the commercial vehicles use the shoulder as they meet oncoming traffic. The corresponding value is 17% on highways with bituminous shoulders.

6. Hazardous traffic conditions exist on pavements less than 22 ft. wide that carry even moderate volumes of mixed traffic. On 18-ft. pavements with grass or gravel shoulders, 11% of the drivers of trucks and 5% of the drivers of passenger cars fail to keep their vehicles within their proper traffic lane even when meeting oncoming traffic.

7. Drivers do not reduce their speeds when meeting other vehicles on narrow pavements even though body clearances are definitely inadequate.

8. When a passenger car meets a commercial vehicle on a pavement 22 feet wide, the passenger car has the desired center and edge clearances but the commercial vehicle does not. To permit desired clearances for commercial vehicles a 24-ft. pavement is required.

In connection with the Public Roads Administration's conclusions 1, 2, 3, 5, 6 and 8 above, certain observations by Arthur C. Waller, of the Pacific Coast Division of the Asphalt Institute, bear definitely on the points under consideration. Mr. Waller notes that at present, on coast and inter-mountain highways, there is a much greater mileage of roads that have no shoulder treatment of any sort than of those that are properly designed. It is true that many miles are surfaced for the full width of the fill or embankment, but that shoulders, as the motorist knows them, are largely composed of earth without any treatment whatsoever. Every operator of a motor vehicle is aware of the difference in grade that often exists between the paved-highway surface and the contiguous unimproved shoulder. A difference of only a few inches may be the origin of a serious accident. In addition, it may cause difficulty in regaining the paved surface, and so bring about a traffic delay if it does not result in "side swiping," or a more fatal collision.

A fact that seems to have been overlooked in the survey carried out by the Public Roads Administration study is the circumstance that shoulders are, to some extent, used by the slowest and heaviest vehicles, which exert the greatest tractive effort in propulsion. This would seem to call for a well compacted subgrade and a durable surface for all shoulders to absorb the thrusts due to stopping and starting.

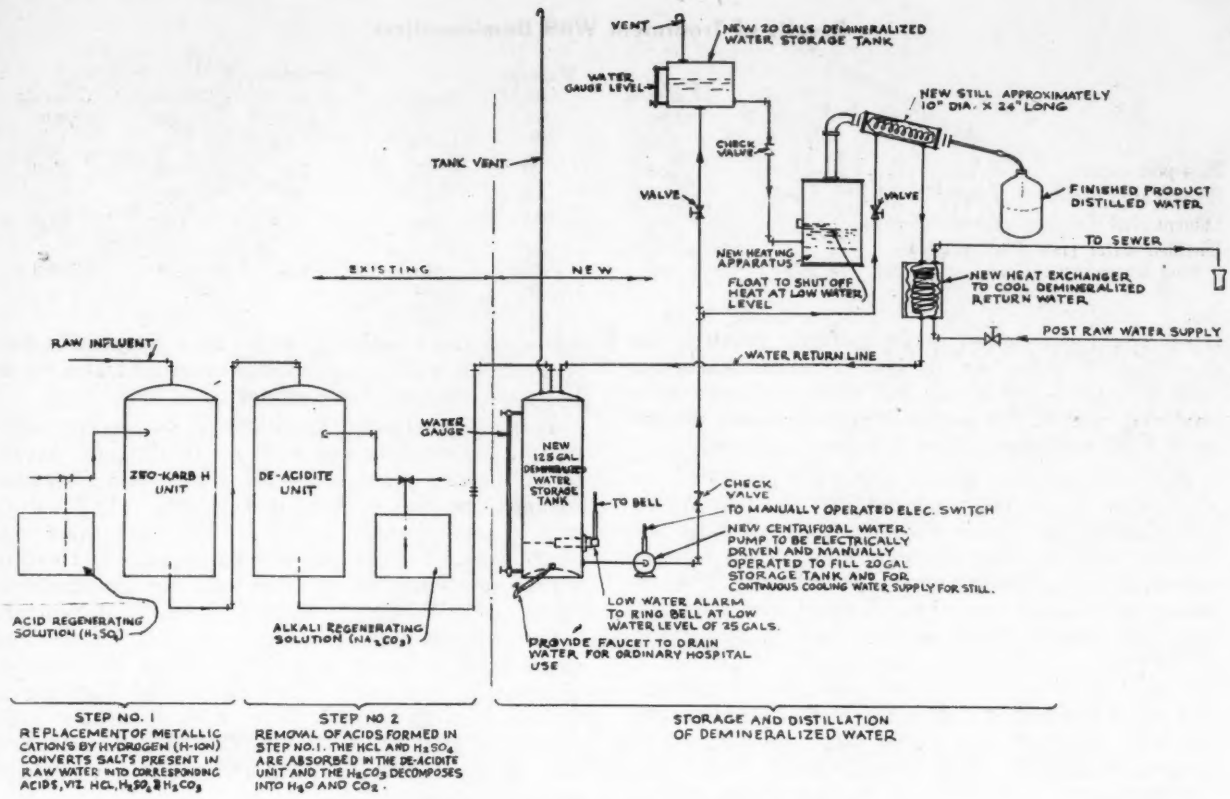
There is a feeling among highway officials that there should be some easily perceivable demarkation between the surface of the road and the shoulders, and that the absence of this clear difference constitutes a hazard to driving. However, the experience of the Public Roads Administration seems to be that the accident frequency on roads with lip curbs is no greater than on roads having untreated shoulders. One has only to recall how often, in reading of automobile accidents, they have encountered references to "soft shoulders" as a contributing cause to realize how definitely dangerous are such portions of the right-of-way, when softened by rain or spring thaws.

Nor is the obligation to the travelling public met merely by the erection of signs warning that the shoulders are in no condition to carry traffic. Public-carrier systems would not find safety in any court of law if they operated faulty equipment, even if the travelling public were warned by easily visible signs to that effect.

Nor should the added cost of providing safe shoulders be a barrier to their adoption. It is a probable fact that a careful analysis of the costs incurred by the constant maintenance of unsurfaced shoulders, plus the damage sustained by the breaking down of edges, would show that these two sums outweigh the cost of providing a properly constructed shoulder from the beginning.

A New Chemical Weed Killer

Professor A. S. Crafts of the University of California has developed a new chemical weed killer which bears the somewhat imposing name of 2,4 dinitro 6 secondary butyl phenol. It is applied as an emulsion in a small quantity of oil and a large amount of water. It is less inflammable and less expensive to transport than oil, and safer to use than arsenical weed-killers in areas where livestock are pastured.


VENT
NEW 20 GALS DEMINERALIZED WATER STORAGE TANK
WATER GAUGE LEVEL
NEW STILL APPROXIMATELY 10" DIA. X 24" LONG
CHECK VALVE
TANK VENT
VALVE
VALVE
FINISHED PRODUCT DISTILLED WATER
TO SEWER
NEW HEATING APPARATUS
EXISTING
NEW
FLOAT TO SHUT OFF HEAT AT LOW WATER LEVEL
NEW HEAT EXCHANGER TO COOL DEMINERALIZED RETURN WATER
POST RAW WATER SUPPLY
RAW INFLUENT
WATER RETURN LINE
WATER GAUGE
ZEO-KARB H UNIT
DE-ACIDITE UNIT
NEW 125 GAL DEMINERALIZED WATER STORAGE TANK
TO BELL
CHECK VALVE
TO MANUALLY OPERATED ELEC. SWITCH
NEW CENTRIFUGAL WATER PUMP TO BE ELECTRICALLY DRIVEN AND MANUALLY OPERATED TO FILL 20 GAL STORAGE TANK AND FOR CONTINUOUS COOLING WATER SUPPLY FOR STILL.
ACID REGENERATING SOLUTION (H_2SO_4)
ALKALI REGENERATING SOLUTION (Na_2CO_3)
LOW WATER ALARM TO RING BELL AT LOW WATER LEVEL OF 25 GALS.
PROVIDE FAUCET TO DRAIN WATER FOR ORDINARY HOSPITAL USE
STEP NO. 1
REPLACEMENT OF METALLIC CATIONS BY HYDROGEN (H-ION) CONVERTS SALTS PRESENT IN RAW WATER INTO CORRESPONDING ACIDS, VIZ. HCL, H_2SO_4 & H_2CO_3
STEP NO 2
REMOVAL OF ACIDS FORMED IN STEP NO.1. THE HCL AND H_2SO_4 ARE ABSORBED IN THE DE-ACIDITE UNIT AND THE H_2CO_3 DECOMPOSES INTO H_2O AND CO_2.
STORAGE AND DISTILLATION OF DEMINERALIZED WATER

Layout of Demineralizer and Distilled Water Equipment.

Water Demineralizer Installation for An Army Laboratory

A difficult water was treated by modern methods, resulting in a material saving in costs.

BECAUSE of the high content of scale forming and soluble materials in the water supplied to the Mayo General Hospital, Galesburg, Ill., much difficulty was encountered in the operation of the equipment for producing distilled water for hospital and laboratory purposes. Scale formation was so severe on both the steam and water sides of the heat exchanger coils of the distilling equipment that manual acid cleaning of the equipment was necessary at 6 to 10-day intervals. In addition, after only 2 hours of operation, the capacity of the stills was reduced from 30 gallons in 24 hours to 10 gallons because of scale formation. The quality of the distillate, because of the carryover of the concentrated residue in the distilling pot, was such as to be unfit for either laboratory or hospital use.

A typical chemical analysis of the water, which is from a deep well, follows:

Alkalinity as ppm $CaCO_3$	258	Calcium as ppm Ca	68
Sulphate as ppm SO_4	530	Magnesium as ppm Mg	29
Chlorides as ppm Cl	220	Hardness as ppm $CaCO_3$	343
Sodium as ppm Na	232	Total Dissolved Solids as ppm	1403
Silica as ppm SiO_2	9		

Consideration was given to treatment of the water needed for the stills by the sodium cycle zeolite softening process, but the analysis of the water indicated that this process would not work. The calcium and magnesium salts would be converted to sodium salts, which would increase the tendency to foam; and the quantity of dissolved solids would not be reduced. The Permutit Co. proposed the use of a combination acid regenerated carbonaceous water softening and decationizing unit and a soda ash regenerated aliphatic amine resinous de-anionizing unit having a total capacity between regenerations of 100 gallons. This combination of treatments, by chemical absorption, removes the scale forming salts of calcium and magnesium and other cations in the primary or carbonaceous unit, while the acids formed by the primary unit are removed by the secondary or resinous unit. The estimated cost of the unit was $1,800.

About 100 gallons per day of distilled water are required at the hospital. Cost studies indicated that this amount of water could be demineralized by the proposed equipment in about 30 minutes; and that 1½ to 2 hours per day would be required for operation, including regenerating and rinsing the demineralizer and producing the 100 gallons required. The estimated cost of chemicals was 32 cents per 100 gallons;

Results of Treatment With Demineralizer

	Total Dissolved Solids	*Calcium ppm Ca*	*Magnesium ppm Mg*	*Sodium ppm Na*	*Bicarbonate ppm HCO_3*	*Sulfate ppm SO_4*	*Chloride ppm Cl*
Raw post water	1403	68	29	232	256	530	220
Effluent after demineralization of 25 gals.	62	1.0	1.0	8.0	37	0.0	14.0
Effluent after demineralization of 65 gals.	80	1.8	1.0	14.0	41	0.0	18.0
Distilled water (raw Post supply) from laboratory	237	0.2	0.0	65.0	8.0	2.0	149.0

labor would not exceed that previously required for distilling. In comparison, the cost of the distilled water needed by the hospital over and above that previously produced, was $2,200 per year. The economic advantage of the new process was therefore apparent.

The accompanying sketch shows the layout of the plant. Raw water is introduced into the primary or carbonaceous unit. The scale-forming materials are removed, and since the exchange mineral is a form of carbon, it is possible to regenerate with acid. The secondary or resinous unit is regenerated with soda ash. The resin absorbs the acids, contained in the effluent of the primary unit; and carbonic acid, if present, is converted to carbon dioxide and water. The demineralized water is piped to a stainless steel 125-gallon storage tank, equipped with a float actuated alarm which operates when the level drops to 25 gallons.

Because of the character of the raw water, cooling of the distilling head must be accomplished with demineralized water in order to prevent serious scaling. In order to conserve the demineralized water, that used for cooling is recovered, cooled by a heat exchanger, and returned to the 125-gallon storage tank. Since the temperature of this water rarely exceeds 115°F., scale formation in the heat exchanger is not expected to be serious.

The operation of this unit exceeded expectations. A series of tests indicated that hardness-free water, with 90% or more of the mineral removed, could be expected. In fact, the reduction in mineral content of the water previously distilled was only 77%. Tests in October, 1945, gave the results shown above.

The water produced by this unit is sufficiently free of mineral content to be suitable for use in sterilizers and for limited laboratory purposes. In fact, about 60% of the water required is for these purposes and is used without further treatment. The remaining 40% is needed for physiological purposes and for reagents. A single distillation of the demineralized water produces water suitable for these purposes.

Purification of Sewage Grease in Africa

THE sewage of Klipspruit, South Africa, averages about 7 mgd, from which 1200 to 1400 lbs. of crude wet grease is recovered per 24 hr. B. R. Spencer, the manager of the sewage works, recovered the grease by suspending a sack under the scum pipes. Mixed with all floating materials, including abattoir waste and nightsoil, it was very foul and septic. To lessen the odor and biological danger it was melted, strained, and heat-dried by means of digester gas. But it could not be sold for use in the ordinary soap boiling process because of its odor and high content of lime soaps, which ranged from 30 to 60%. Free fatty acids constituted 30 to 50%, glycerides or unsplit fats up to 10% and unsaponifiable matter up to 10%.

Following extended investigation by the city laboratory, a pilot plant was built for treating the grease by the process developed. This process is a somewhat complex one, and in brief it comprises: (1) Heating with a small percentage of crude concentrated sulphuric acid. (2) Washing with hot water. (3) Heating with a small amount of a fat splitting Twitchell reagent. (4) Washing with hot water. (5) Neutralization with ground limestone. (6) Distillation with steam from a copper still. (7) Casting the distilled grease into slabs. (8) Pressing the cooled grease to squeeze out the liquid fatty acids from the solid crystalline fatty acids. (9) Re-distillation of the liquid and re-pressing the solid fatty acids if very high quality is required.

From the 1,200 to 1,400 lbs. of crude wet grease daily recoverable, about 400 to 500 lbs. of mixed distilled fatty acids could be obtained, and this yielded about 150 lbs. of liquid or "Oleic" acid and 300 lbs. of solid or "Stearic" acid, with some 50 to 100 lbs. of still residue grease.

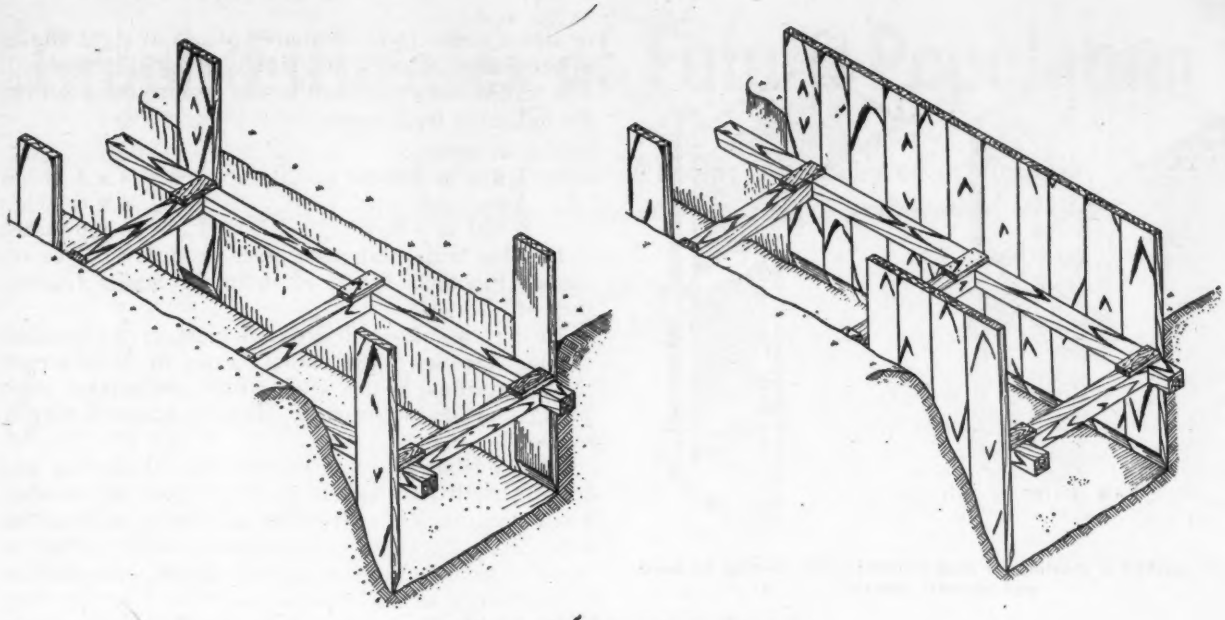
This pilot plant was built during the war, using second-hand materials available, and was not expected to last for a very long time, and after running for more than a year was discontinued because such frequent repairs were needed. However, sufficient experience was gained on the pilot plant to indicate that, on the scale afforded by the amount of crude grease available at Klipspruit, the process could be expected, even at pre-war sale prices, to yield a reasonable profit over all working expenses. As the products from a more efficient plant would replace some of the imported materials, a new specially designed plant costing about £ 3,000, is under consideration by the City Council. Some of the components of the pilot plant will be used in the larger plant.

The double-pressed stearic acid produced by the pilot plant sold readily in 1943 and 1944 for 1 s. 6 d. per pound, and the double-distilled oleic acid for 1 s. 3 d. per pound; and the dark brown residue left in the still was sold at about 1 d. per pound as a leather dressing. These were about double the pre-war prices.

The uses to which the free fatty acids are put in industries are very extensive, and it is expected that the new plant will produce the very hard grades of stearic and the very pure oleic acid which certain industries demand.

The laboratory staff has made a wide range of commodities from the purified fatty acids, including excellent shaving soaps and creams and other cosmetics. Sentimental objection to the origin will, of course, limit the use of these highly purified products.

The above information is condensed from a paper by H. Wilson, city bio-chemist of Johannesburg, before the Institution of Municipal and County Engineers, S. A. District.



Methods of Starting Sheeting for Trenches.

Army Safety Requirements for Excavations

The following standards for good practice in trench excavation were prepared by the Safety and Accident Prevention Division of the Corps of Engineers. As presented here they can be incorporated into construction specifications.

1. The sides of excavation 5 feet or more in depth shall be supported by substantial and adequate sheeting, sheet piling, bracing, shoring, etc., or the sides sloped to the angle of repose. Substantial and adequate sheeting, sheet piling, bracing, shoring, etc., shall be based upon calculations of pressures exerted by, and the condition of, the materials to be retained.

2. Foundations, adjacent to where excavation is to be made below the depth of the foundation, shall be supported by shoring, bracing, or underpinning as long as the excavation shall remain open.

3. Excavated or other material shall not be stored nearer than 2 feet from the edge of the excavation.

4. Bridges or walkways with guard rails shall be provided where men or equipment must cross over trenches, ditches, etc. A temporary guard railing or other effective guard or barricade shall be provided at or near the edge of an excavation as soon as possible, except where the installation of such safeguard will interfere with the excavation or other work.

5. Red lights or torches, maintained from sunset to sunup, shall be placed on excavation barricades and along the sides of unbarricaded excavations which are exposed to paths, walkways, sidewalks, driveways, or thoroughfares.

6. Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition and timbers used shall be sound, free from large or loose knots, and of the required dimensions. The material specifications are the minimum requirements and the spacing of material members is the maximum allowable in securing trenches against slips, cave-ins, and slides. Where conditions are encountered which require materials of greater strength or closer spacing of timbers to hold the soils securely in place, the sizes of timbers in such cases shall be increased to compensate for the overload.

Trench Excavation

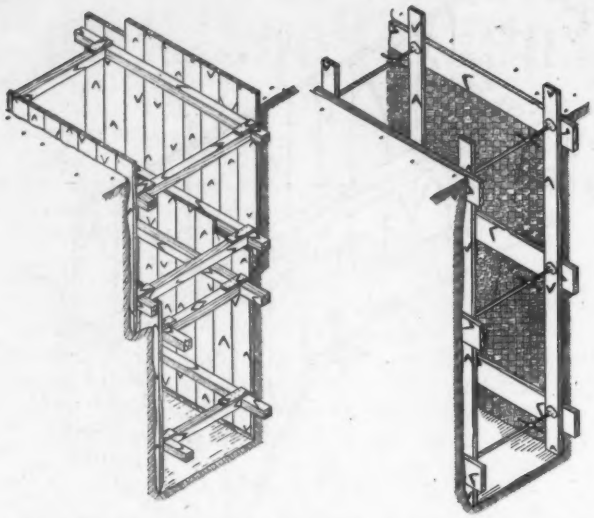
7. The following provision for shoring and bracing of trenches shall not apply where solid rock, hard slag, or hard shale is encountered or in which employees are not required to be or to work.

8. The sides of trenches in material, other than those listed in paragraph 12, which are 5 feet or more in depth and 8 feet or more in length shall be securely held by shoring and bracing, or sloped to the angle of repose of the material being excavated.

9. If the unit tunnel method is used, the length of earth left in place between the separate unit trenches shall be not less than one-half the depth of the trench and shall be considered as taking the place of shoring and bracing.

10. Whenever or wherever the unit tunnel method is used and where there is apparent danger of slips, slides, or cave-ins, trenches or tunnels in which men are employed shall be shored and braced or otherwise retained as may be necessary to prevent caving.

11. Trenches over 8 feet in length and 5 feet or more in depth in hard compact material, shall be braced at intervals not exceeding 8 feet, with 2-inch by 6-inch planks, or heavier material, placed vertically in the trench opposite each other, backed up by 2-inch by 10-inch planks bearing against the walls at the same intervals as cross braces, struts, or trench jacks. These braces shall, if possible, extend to the bottom of the trench and be supported by horizontal cross braces or struts. Bracing and shoring of trenches shall be carried along with the excavation and must in no case be omitted, except where a mechanical digger is used.



Left, method of sheeting for deep trenches; right, bracing for hard and compact material.

the shoring shall be placed within 6 feet of the lower end of the boom. Undercutting shall not exceed 6 inches on either side of the trench.

12. In partly saturated, filled or unstable soils or where running material is encountered, such as quicksand, loose gravel, loose shale, or completely saturated material, the sides of the trenches 4 feet or more in depth shall be secured by the use of continuous vertical sheet piling and suitable braces. In trenches over 4 feet in depth wooden sheet piling shall be not less than 2 inches in thickness.

13. Sheet piling shall be held in place by longitudinal beams at vertical intervals of 4 feet. The longitudinal beams shall in turn be supported by the cross braces or struts spaced a maximum of 4 feet. The longitudinal beams shall be in no case less in strength than that of a 4- by 4-inch beam; and when the longitudinal distance between cross braces or struts exceeds 4 feet and is less than 6 feet, the longitudinal beam shall be not less than a 4- by 6-inch beam.

14. Vertical braces and longitudinal beams in trenches shall be supported by horizontal cross braces or struts, screw jacks, or timber placed at right angles to both braces, cleated and rigidly screwed or wedged. The timbers or struts shall be not less in strength than the following trade sizes:

Width of trench:	*Size of cross Braces or Struts*
1 foot to 3 feet	4 x 4 inches
3 feet to 6 feet	4 x 6 inches
6 feet to 8 feet	6 x 6 inches

15. One horizontal cross brace or strut shall be required for each 4 feet of depth or major fraction thereof.

16. In case it is desired to increase the vertical spacing between longitudinal beams or cross struts, the longitudinal beams, cross struts, and vertical sheet piling shall be increased in size to compensate for the overload.

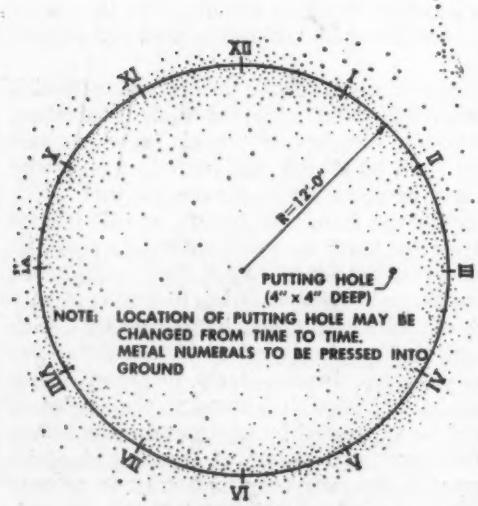
17. Additional precautions by way of shoring and bracing shall be taken to prevent slides, or cave-ins, when excavations or trenches are made in locations adjacent to backfield excavations or subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.

18. Ladders, extending from the floor of trench excavation to not less than 3 feet above the top ground surface, shall be placed in the trench excavation at 50-foot intervals to be used as a means of entrance and exit therefrom.

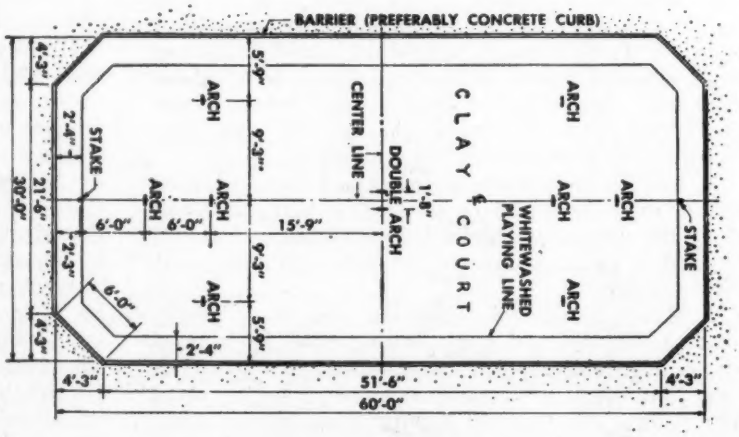
Contractor Builds Incinerator and Leases It to City

Culver City, California (estimated 14,000), has received bids for the construction of an incinerator to handle combustible rubbish. The incinerator will be built on city-owned land by a contractor who will own the plant and lease it to the city at a specified monthly amount. The incinerator, which will have a capacity of four tons per hour, will be operated by the city. The lease-contract arrangement gives the city a series of options to purchase the plant at one-year intervals for a period of ten years, the price decreasing each year. The plan used by the city in financing makes it possible to have an incinerator without floating a bond issue or making a large capital outlay. —*Public Management.*

Layouts of Playgrounds and Athletic Fields



CLOCK GOLF



ROQUE COURT

Courtesy War Department, U.S.A.

Graph Estimates of Future Population

Errors incident to use of extrapolated curves are reviewed in the light of two specific small cities for which estimates were prepared in 1915.

By HENRY W. TAYLOR
Consulting Engineer

DISCOVERY of a population curve in the engineering files of the City of Norwich, N. Y., and one in my own files for the City of Oneonta, N. Y., both prepared prior to 1915, prompted a review in retrospect of their preparation and error.

The extrapolation of population curves, in an effort to estimate future population, involves more technique than smooth French curves or tangents and more than comparisons with population curves of other cities which have supposedly similar characteristics. The truth of this statement may be illustrated by reference to population studies, made some time ago and now subject to review in the light of actual census figures in the period subsequent to the original study. Such a review also brings out certain factors which were neglected in the original study and which are of importance in future estimating procedure.

The first factor in this review is the census data that were available in 1915, with a sufficient background to warrant consideration. The following tables list the cities of New York State, census data for which extended back to at least 1870. These cities are divided into three groups as noted.

New York State Cities With Census Data Available from 1870

Group I.—Populations, 1940, less than 20,000

City	Curve	City	Curve
Batavia	1	Johnstown	—
Beacon	2	Little Falls	13
Corning	4	Messena	—
Cortland	5	Ogdensburg	—
Dunkirk	—	Oneida	15
Fulton	6	Oneonta	16
Geneva	7	Ossining	—
Glen Falls	8	Peekskill	—
Hempstead	—	Port Jervis	18
Herkimer	—	Saratoga Springs	—
Hornell	10	Tonowanda	—
Hudson	11	Watervliet	—
		Norwich	21

Group II.—Populations, 1940, 20,000-40,000

City	Curve	City	Curve
Amsterdam	—	Lockport	14
Auburn	—	Middletown	—
Cohoes	3	Newburgh	—
Elmira	—	Olean	—
Gloversville	9	Oswego	17
Ithaca	—	Port Chester	—
Jamestown	—	Rome	19
Kingston	12	Watertown	20
		White Plains	—

Group III.—Populations, 1940, over 40,000

City	Curve	City	Curve
Albany	—	Poughkeepsie	—
Binghamton	—	Rochester	—
Buffalo	—	Schenectady	—
Mt. Vernon	—	Syracuse	—
New Rochelle	—	Troy	—
New York	—	Utica	—
		Yonkers	—

The accompanying chart, Fig. 1, includes cities from Groups I and II. Of a total in the first group of 25 cities, 14 population curves are plotted. Of a total of 17 in the second group, 7 curves are plotted. The present discussion does not include the cities in the third group.

The Norwich curve, No. 21, is shown produced from 1915 to 1950 by a heavy broken line, to yield in 1950 a population of 17,400. The actual population in 1940 was 8,700 and will probably be about 9,000 in 1950. For the 1915 study of future population, the following population curves were selected as comparable and suggestive:

City	Curve	City	Curve
Batavia	1	Hornell	10
Cortland	5	Oneida	15
Fulton	6	Oneonta	16
Geneva	7		

In order to simplify the data presented, Fig. 2 has been prepared, showing only Batavia, Beacon, Oneonta and Norwich, with the 1915 projections to 1950, and the actual populations to 1940 for the two latter cities.

Estimating future populations is a subject far beyond the scope of a short article and the present discussion is confined to principles which were ignored in the original studies as illustrated by subsequent population development. The major factor leading to the exaggerated estimate is a complete denial of any possibility of a marked change in curvature indicating a reduced rate of population increase. It is assumed that an initial impetus is never slackened. This flattening of curves was initiated in most cases about 1910. Major exceptions are for Batavia and Glen Falls. This future flattening of curvature was not suggested to any marked extent by the slopes between 1900 and 1910 in Group I. The Group II curves suggest that after

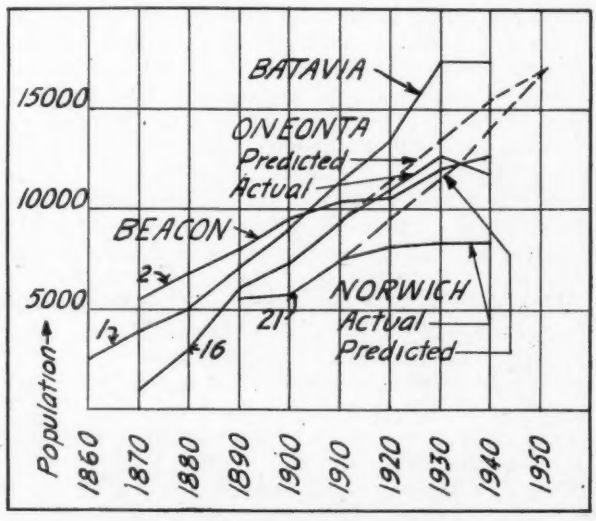


Fig. 2. Actual and predicted populations.

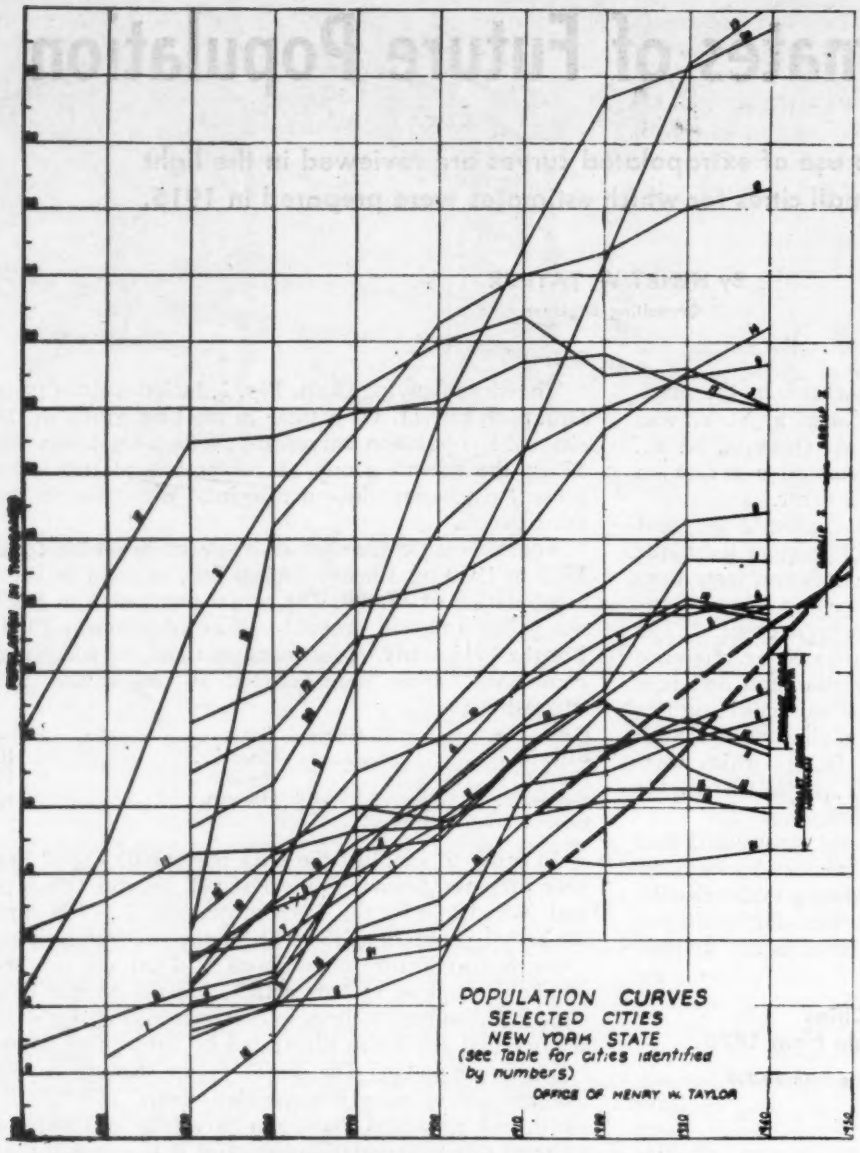


Fig. 1. Curves showing the trend of population (see tables).

a rapid growth, reduced rates of increase develop, but this is not borne out in the case of Rome and Watertown, neither of which is comparable to Norwich.

The second difficulty arose from selection of a tangent parallel to the past curves of Batavia and Fulton instead of other more comparable cities. Fulton, recently a city, had included adjacent communities, thus showing a sudden rapid growth. Batavia's location and industries rendered it not comparable. Had the other "comparable" curves been given more weight, the estimate for 1950 would have been considerably reduced. The use of the State census data in 1915 in conjunction with Federal census figures introduced a possibility of error since the two censi are compiled by different methods and are therefore not exactly comparable.

However, the principal factor which influenced the exaggeration of the population estimate was the stress on comparison with other cities rather than a study of the city itself. Such a study would include an examination of the social theory of the community. Such a theory exists, consciously or unconsciously, especially in the smaller cities. In cities ranging from 10,000 to 20,000 population, which are outside the range of metropolitan influence, the social theory encourages the ownership of a house and lot as against a major housing development of multi-family housing. The separate houses in these cities are, as a rule, well maintained and are surrounded by a neatly kept yard of ample proportions. Crowding of houses or concentration of population is not a part of the municipal background or of future planning. The municipal policy in these smaller communities is generally adverse to the rented multi-family house or apartment house on the theory that those who lease living quarters are supplied with a large number of municipal services to which they do not contribute as taxpayers. The property, itself, must carry these service costs and the rentals that can be obtained rarely absorb these costs adequately. As a result, the multi-family properties must be favored in taxation to make them profitable. It follows that the home owner carries some percentage of this burden of service charge in excess of that chargeable to his own property.

Population saturation is not a physical problem in these cases; it is not dictated by the number of houses that could be built within a corporate area; it is dictated by the social theory of the community, the past and present practices and attitudes, unspoken and perhaps unrecognized. Such a theory may be completely wrecked by an earthquake, a war, or discovery of gold or oil; but in the main a given general local atmosphere will be maintained against considerable effort to change it. The major changes take the form of additional municipal facilities which are physical changes rather than changes in social theory.

A second factor which, in the particular case of Norwich, has played a large part in determining the point of change in population curve trend is topographical. The city area is triangular in shape, the apex being at the south and the junction of the Chenango River and Canasawacta Creek. The sides of the triangle are the river and the creek; the base of the triangle is an arbitrary line. To the west are steep hills; to the north are frequently flooded river flats. To the east are flooded areas bordered by hills except for a plateau whose development would represent an essentially separate community center, accessible only from the narrow southern section of the existing corporate area. To the south, the apex of the triangle points to low farm lands frequently flooded. Hydraulics and topography represent two barriers to expansion, while inside the existing corporate area, the social theory does not encourage rapid expansion. Though Norwich is located in an agricultural area, it has important and active industries as well, and is served by two railroads. Between the industrial and agricultural, it holds itself in comfortable balance. It is doubtful if

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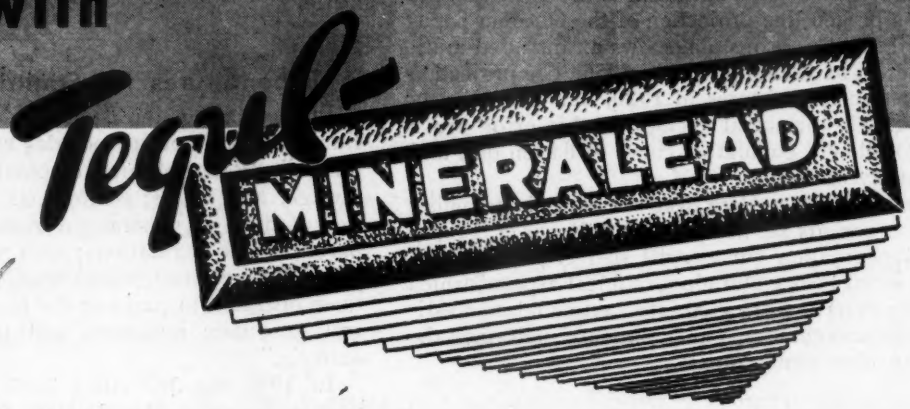

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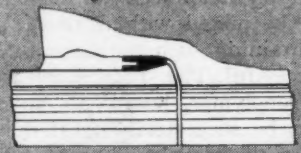

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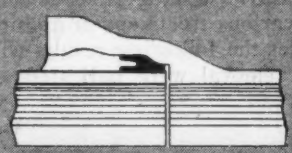

STRAIGHT End Pipe

any one familiar with the community would wish to have it other than it is, with a gradual growth and increasing public services and improvements. Social theory and topography, among other factors, have thus influenced the population curve far more than parallelism with other cities.

A similar case of over-optimism is illustrated on the chart by a broken line projection of the Oneonta population, Fig. 2. The projection shows an intended minimum forecast of 17,000 people in 1950. The projection conforms to census figures in 1920, but misses badly thereafter. The principal factors in this error are a refusal to allow a population curve to flatten out, and lack of study of the city itself.

Fortunately, census data over an increasing number of ten-year periods are now available. However, graph-extended population curves will still require a local study of social theory and topographical aspects, which may prove to have more vital effect on population estimates than smooth curves and tangents, imitating the growth of other communities.

Tastes and Odors Due to Synthetic Rubber Wastes

Wastes discharged by the synthetic rubber industry have created new difficulties in the treatment of water for public use. These were discussed by C. R. Placak and C. C. Ruchhoft, of the U. S. Public Health Service, in a paper before the Cincinnati Section of the American Chemical Society.

These wastes have very high taste and odor-imparting qualities and are unusual in that they are resistant to change by the natural purification processes operating in streams, the investigations disclosed. According to the authors, "an outstanding characteristic of these odors is their resistance to natural purification under the most favorable conditions for their biochemical removal. Laboratory studies demonstrated that little removal occurred in ten days using dilutions of these wastes. This implies that reduction in odor in a stream, for a considerable period, will be proportional mainly to dilution, and, as actually did occur in the Ohio, will create a very difficult water processing problem.

"The permanence of these tastes and odors in streams under the most favorable conditions for their biochemical removal and the failure of the production of a palatable water by any of the modern water treatment processes made it necessary to study means of treatment of such wastes before their discharge into streams.

"An exploratory study of physical, chemical and biological processes indicated that the latter were most promising for the satisfactory reduction of both taste and odor characteristics and BOD, or biological oxygen demand. Experiments with biological treatment procedures, including activated sludge and sprinkling filters, indicated that treatment of individual wastes from butadiene or styrene manufacture would be very difficult because of the lack of the necessary nitrogen and phosphorous requirements.

"If such wastes can be mixed with domestic sewage or other wastes containing such constituents, biological treatment is successful. The study showed that composite waste from copolymer, butadiene and styrene manufacture could be successfully treated by a modified activated sludge that developed on aeration."

Using various treatment procedures on dilutions of these wastes the following results with respect to taste and odor removal were indicated:

"Coagulation is of little value. Ozone accomplishes little and in the case of styrene waste alters the odor to make it more objectionable. Activated carbon completely removes the odor if sufficient carbon is used. Breakpoint chlorination is effective if the impossible condition of maintaining the treatment directly at the breakpoint is accomplished."

Expenditures for Sanitation by Cities

In tabulating the statistics collected by it, the Bureau of the Census includes under the head "Sanitation," "Removal and disposal of street deposits, sewage, and waste; comfort stations with the exception of those in general-government buildings and in parks; smoke regulations; such miscellaneous services as public laundries, washhouses, and baths other than those operated in parks or for recreation; and the control of public nuisances and the removal of dead animals."

In 1943 the 397 cities having more than 25,000 population spent $138,959,000 for operation of sanitation functions. As these cities contained about 50,000,000 population, this gives about $2.78 per capita.

"Expenditures for operation" of sanitation services in the 37 cities of over 250,000 population are further classified under "Sanitation" as for "Sewers and sewage disposal," "Street sanitation," "Waste collection and disposal" and "Other." Considering these 37 as a group, we find that in 1943, they spent $93,760,000. or about $3.15 per capita. Of this total, 16.9% ($15,822,000 or 52 cts. per capita) was for sewers and sewage disposal, 26.7% was for street sanitation, 53.7% for waste collection and disposal and 2.8% for other.

The percentages vary with the sizes of the cities. The 23 cities of 250,000 to 500,000 population spent 23% for sewers and sewage disposal, 24% for street sanitation, 49% for waste collection and disposal and 4% for other.

The expenditures for sanitation by cities of 25,000 to 250,000 were not further classified. Considering the total expenditures for "Sanitation," these are found to average 7.4% of all expenditures for "Operation" by the entire 397 cities; the averages for the several population groups varying from 7.3% for the 200 cities of 25,000 to 50,000, to 8.0% for the 105 cities of 50,000 to 100,000.

Ground Water Levels Rise in Memphis Area

The falling off or the complete cessation of war production has drastically reduced the emergency draft on the wells that supply water to Memphis Tenn. The estimated pumpage was smaller by about 13 mgd. in August, 1945 than in July, 1945, and smaller by about 17 mgd. than in August, 1944; and as a result, the water level in the 500-foot sand, from which the supply is obtained, is rising in this area. Since August, 1944 the level in the wells has risen 0.5 to 1.5 feet. Beyond the city limits the rise was even greater, the water standing as much as 3.5 feet higher than it did during the same month of the preceding year, although in recent years the trend had been persistently downwards, according to W. E. Wrather, director of the Geological Survey who based his information on data obtained through the cooperative efforts of the Geological Survey and the Memphis Light, Gas and Water Division.

Would you consider the testimony of 195 water works superintendents *important?* They report that the maintenance cost of cast iron distribution mains is far below that of other pipe materials. Would you value the experience of water supply systems in 200 of our largest cities? They report that some or all of their original cast iron mains are still functioning, after generations of service. There can be no doubt that the long life and well-nigh trouble-free service of cast iron pipe mean economy —*substantial* economy—in water works operation. Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, Peoples Gas Building, Chicago 3, Illinois.

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Ranney well during the 1943 flood. Filtration plant during the 1943 flood.

High Iron Content in the Water of Crystal City, Mo.

Solution of troubles caused by the high iron content of well water, attempted during a period of a quarter century, has apparently been reached by the method described in this article.

By WILLIAM WHEATLY
Chemist, Pittsburgh Plate Glass Co.

THIS article is supposed to be about water. However, the development of plate glass manufacturing and the development of our water supply at Works No. 9 of the Pittsburgh Plate Glass Co., at Crystal City, Missouri are so closely interwoven that to give an account of the development of our water supply it is necessary to trace the development of plate glass, as that is the thing that has made the development of our water supply necessary and possible.

Near the turn of the century the water supply was not a problem. Plattin Creek furnished water for production purposes, and water for human consumption was supplied by wells twenty to thirty feet deep, or by cisterns. But soon after the turn of the century, hand-powered machinery was replaced by electrical power. Production processes were revolutionized. The old annealing ovens were replaced by an annealing lehr, hand-powered teeming crane was replaced with an electric teeming crane. The small grinding and polishing tables were replaced with circular tables thirty feet in diameter. Old Reliable, an Allis Chalmers 5,000-horsepower steam-electric generator, one of the largest steam-electric generators of that day, was moved from its display stand at the St. Louis World's Fair and set on its base to furnish electric power for this new machinery.

Water consumption increased several hundred percent, and the barrel-and-boy water system were no longer deemed sufficient or proper. Plattin Creek would no longer supply the need. Then it was that attention was turned to the mile-wide valley between the city and the river. Several wells were drilled in this area of the old air-lift type. A large surface reservoir was built and a new pump house. Mains were laid in the city and plant, and our city could boast a modern water supply at a time when most cities in our state were still carrying water from the back yard well or cistern.

Our earliest recollection of Crystal City is of a maze of pipes from the various wells to the reservoirs. Of course the trouble caused by high-iron water was further aggravated by the air used to lift the water, consequently the life of this type of well was very short and the drilling of new wells and abandoning of old clogged ones was a continuous process. When this had continued for a number of years, the porous concrete-type caisson was brought to our attention. Three of those were installed to take the place of the old air lift. For a time it looked as though our problem had been solved, but we soon found that, though they were a decided improvement over the old well, they too clogged in a year or so, and the process of bringing in new wells and abandoning old continued.

Quite naturally, the water delivered to the city and plant mains from the reservoir contained quite a bit of zoological life. It also left iron stains in the pails

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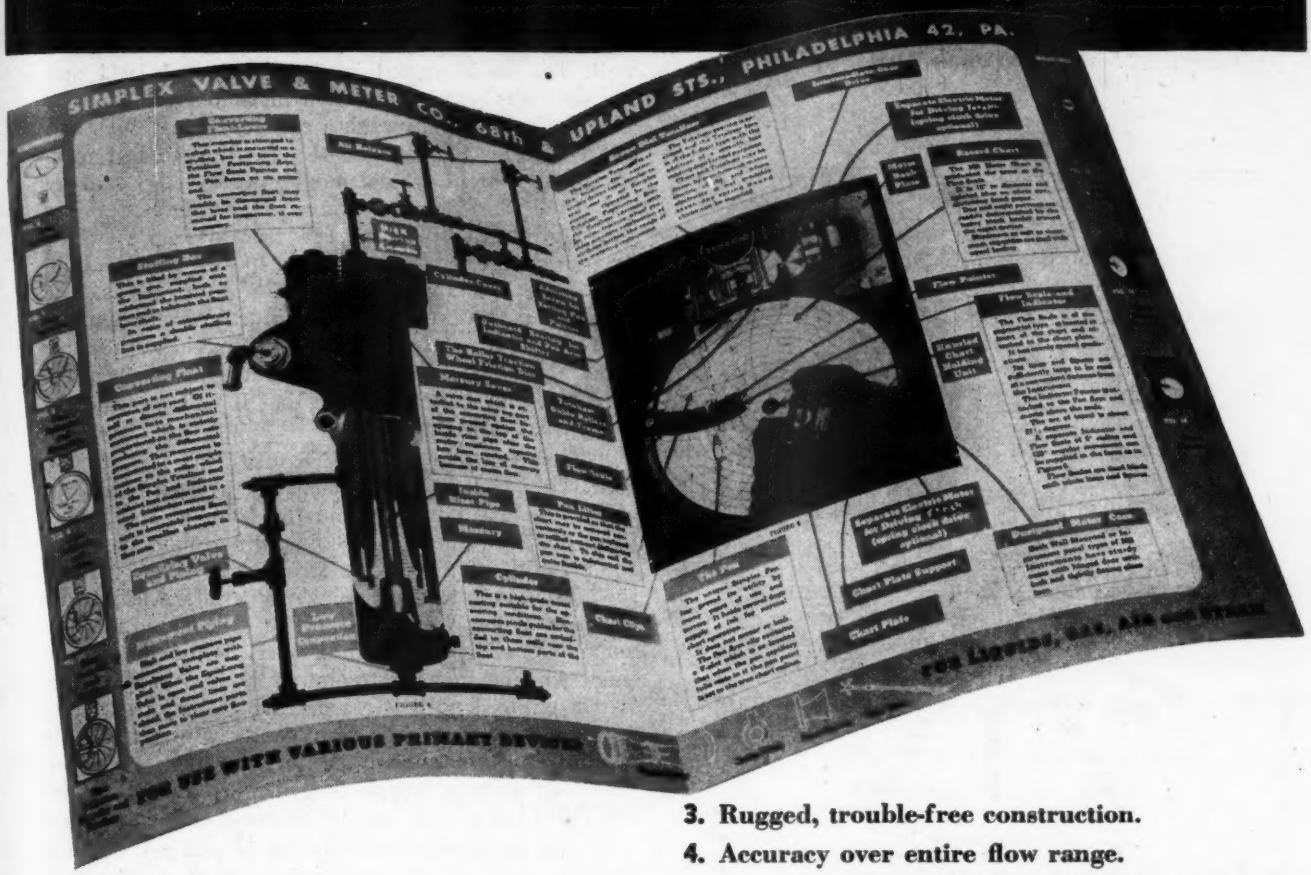

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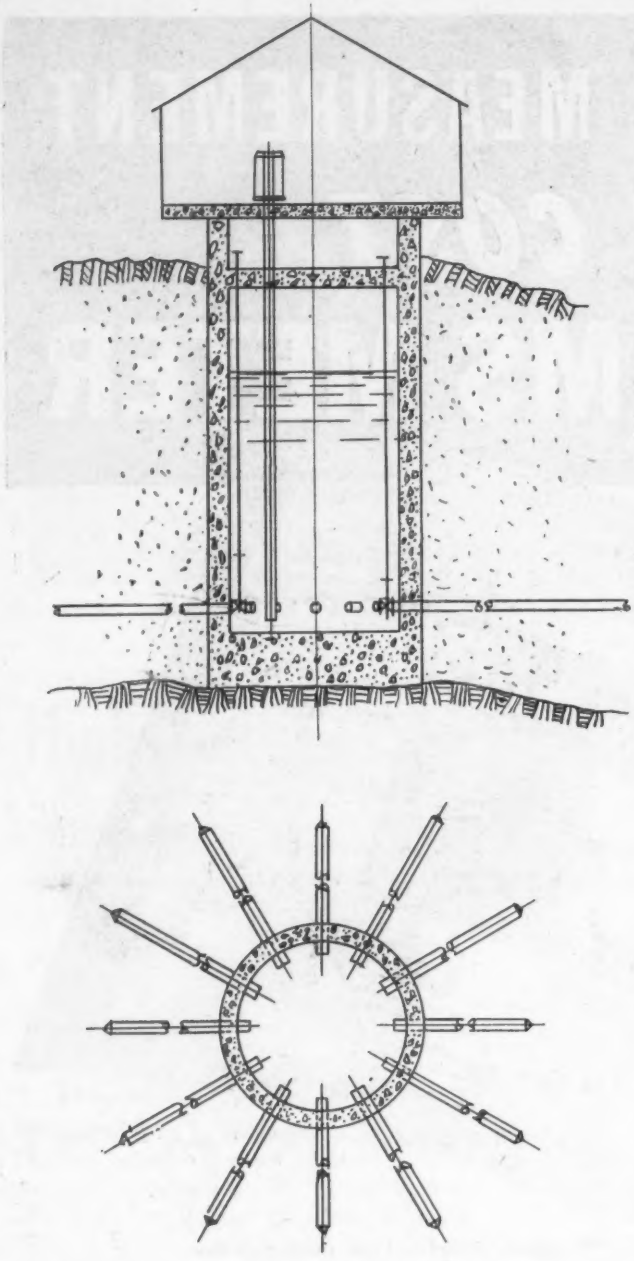

Plan and Section of Ranney well.

and basins and left a ring around the bath tub and also the bather. (Of course, this was not so objectionable at that time, for few of the male inhabitants used the stuff for drinking or bathing anyway, and what the women of that time thought or said mattered little.) Needless to say, however, those who were water drinkers were up in arms. Chief among these was G. W. Oakes, Superintendent of Works Number 9, and as a result the Pittsburgh Plate Glass Company, owner of the water system, built a small (500,000-gallon) modern filtration plant.

The plant was put in operation in 1927. In 1930 the Pittsburgh Plate Glass Company decided to get out of the public utility business, so the city of Crystal City purchased the distribution system in the city for $1.00 and took over the retailing of the water, the glass company continuing to supply the water to the city mains.

In 1930 and again in 1936, the production of plate glass underwent another radical change which required still more water, and the company put in a number of the porous caisson-type wells. These clogged quickly and our problem became very acute and the late Dr. Beuhler, State Geologist, was called in for consultation. He recommended a different type well, but a survey of the various types of wells did not reveal anything that would solve our problem until Ralph Bole, chief engineer, saw a description of the Ranney well in a trade magazine in the latter part of 1940. He wrote for descriptive literature and from the information obtained it seemed that this particular type of well could solve our problem. Mr. Bole and D. J. Coolidge, plant engineer at Works Number 9, visited Chillicothe, Ohio, and Louisville, Kentucky, and inspected wells which were in operation and in the process of installation. They were favorably impressed and recommended the installation of a Ranney well.

The company appropriated $60,000 to build the well. The work started in the summer of 1941 and the well was put in operation in October, 1941. The Foundation Company sank a caisson 16 feet O.D. and 13 feet I.D. which extends 80 ft. deep to bed rock. From the bottom of this the Ranney Well Company projected horizontally twelve 8" perforated pipes ranging from 48 feet to 184 feet in length, which extend out from the well like spokes from a hub. There are 17 blank spaces left for future needs. The anticipated flow was 6,000,000 gpd. We have pumped 5,000,000 gpd. with no reduction in the head or water level. We have had no trouble with it up to the present time, and indications are that it will measure up to original expectations.

The outstanding characteristic of the well is the feeder pipes, In pushing them out, high-pressure air and water are introduced in the point of the feeder pipe, which washes out all fine silt around the pipe for a radius of three feet. This leaves a very porous shell around the feeder pipe, which permits a large flow of water at low velocity which, of course, reduces the amount of silt that would be carried into the feeder lines. Another important point is, the iron in the water is not oxidized until it reaches the well proper. This, of course, is a very important factor with water with a high iron content in the ferrous state. Also the need for storage basins is greatly reduced, as the well itself is a storage basin with considerable capacity.

Water for human consumption is pumped directly from the well into the mixing chamber of the filtration plant. After treating and filtering, the water is pumped to the distribution system which includes a 10,000 gallon standpipe. Water used for cooling and washing purposes in the glass plant is pumped into a large storage basin and from that point is pumped to an independent distribution system, where it is conveyed to the various treating points for special treating for particular uses. Much of this water is returned to the large reservoir, aereated and used again. We think we now have our water supply problem solved for some years to come.

While scarcity of water was one of our earlier troubles, a superabundance due to floods causes us a few days of worry every year or two. The floor level of the Ranney well building was constructed 24 inches higher than any previous flood level except that of 1844. But floods in 1941 and 1943 crested two or more feet above the floor of the well. The accompanying snapshots depict the well and filter buildings during the 1943 flood.

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Kanawha Airport Construction Involves Heavy Grading

New county-built airport requires 10,000,000 yards of excavation, and will have runways up to 6000 feet long. Details of construction, rock excavation, equipment used and drainage.

IN order to serve the air traffic bound to and from an area of one of the largest concentrations of chemical industries in the country, as well as a center for the southern West Virginia coal, oil and gas fields, a new airport was constructed near Charleston, W. Va., which involved nearly 10 million cu. yds. of excavation. When finished, this new field will take the place of Wertz Field, the older field serving Charleston, which had been turned over in 1942 to the Federal Government as the site of a war plant required by the synthetic rubber program.

The 743-acre site for the new airport was purchased by Kanawha County from general funds. The county raised $3,000,000 in 1943 through a people's bond issue, which provided funds for a thorough engineering study of available sites and for the construction of sufficient facilities to begin operations. The passage of P. L. 61 by the 79th Congress permitting the Federal Government to assist projects of this nature resulted in $2,750,000 being appropriated for administration by the Civil Aeronautics Authority to aid the completion of the field.

In the summer of 1944, the first contract for clearing a major portion of the site was placed, and was almost completed at the time the second contract—involving the excavation of 5.2 million cu. yds. of unclassified excavation—was being considered. Contract No. 2 was placed in Sept. 1944, and provided for the greater part of the grading for the runways. Contract No. 3 covers certain extensions to two of the three runways, the completion of the third, and the grading of the Administration Area.

The site selected lay 400 ft. above and three miles by air-line from downtown Charleston. Lying in a high valley, among the peaks of Coonskin Ridge, it was necessary to slice off 9.7 million cu. yds. of mixed excavation to provide for Runway No. 1, which is 6000 ft. in length. Runway No. 2 is 5200 ft. long, and Runway No. 3, which will be an "instrument" runway lying 00°52′ west of north, is 5800 ft. long. All runways will be paved to a width of 150 ft. with a native stone base, and will have a bituminous concrete wearing surface.

Earth fill is placed in 8″ layers and compacted with sheepsfoot rollers. Rock fills are placed in 24″ layers, and call for the use of 10-ton three-wheeled rollers. All the material for fills was obtained by cutting down the tops of four hills to fill the valleys between them. Runway No. 1 is built on the largest fill, which contains 2.7 million cu. yds. and is 230 ft. from toe of slope to top of runway.

Drainage is provided by laying open-joint terra-cotta pipe and coarse broken stone on benches which were constructed on most of the fill sections. These benches vary in width from 18 to 60 ft., and were filled with rock in sizes from 1 to 6 cu. yds., attaining a maximum height of 8 feet on the largest fill.

Blasting is required for almost half of the grading, a cartridge 4½ in. diam., 16 in. long of 40% dynamite is placed in the drill holes, alternately with paper bags filled with a dry inert material. This arrangement or placing of the charges produced a very good fragmentation. Secondary blasting is eliminated by means of drop-weights or "headache balls" operated from a fleet of truck-mounted cranes. This method of reducing the larger fragments that result from the primary blasting, reduced danger to life and eliminated interruption to nearby fill operations.

Excepting only the elevating grader, every type of equipment is employed on the grading. On the earth work in the grading operations, eight Tournapull units, and nineteen 12-cu. yd., four 22-cu. yd. and six 25-cu. yd. tractor-drawn scrapers handle the operations. Shovels of 2 and 2½ cu. yd., working in conjunction with eighteen 12-cu. yd. end-dump trucks, three 25-cu. yd. side-dump trucks, and six tractor-drawn DW-10 wagons transported the rock. Push-dozers, bulldozers, angledozers, cranes, motor graders, sheepsfoot and three-wheel rollers, compressors, and service trucks made a total of 226 units on the grading operations alone. As of Nov. 30, 1945. Contract No. 2 was 75% complete.

To facilitate the filling operations in the base course under the runways, a rock-crushing plant with a daily capacity of 2,000 tons broke down 80,000 tons of rock.

To keep such a quantity of mechanical equipment in working condition is a maintenance job of no mean proportions, especially in light of the fact that most of the machinery was over four years old. The steep grades on the project placed a considerable strain on the over-age motorized hauling units.

The work is being done under the advice of Whitman, Requardt and Associates, Consulting Engineers, of Baltimore, Md., who developed the over-all plan of procedure. They have placed in charge of Contract No. 2 Joseph J. Donohue, M. ASCE; Richard F. Graef, M. ASCE; G. R. Hovell and S. R. Neid. The New York Office of the Civil Aeronautics Authority is in charge of Contract No. 3 and all work done subsequently. The Authority's representatives on the work are R. M. Brown, Assoc. M. ASCE, who is Chief of the Airways Engineering Section, New York Region, and W. B. Hawkins, Resident Engineer. The Washington, D. C., office of the Civil Aeronautics Administration is represented by A. H. Hatfield, Asst. Airways Engineer.

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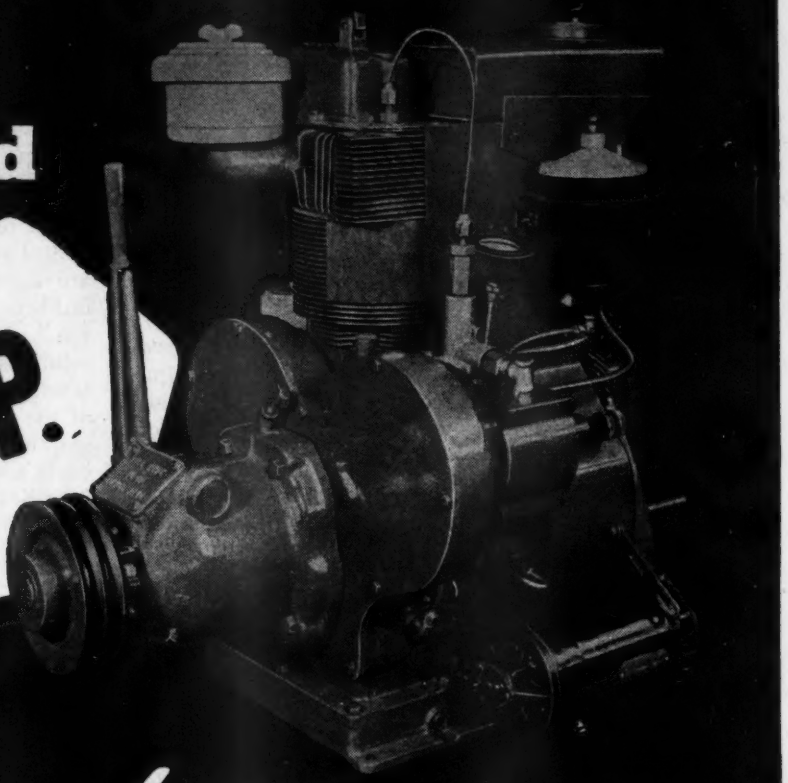

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Overall the engine stands 28½" high, 20¾" wide, 22½" long with crank removed. It is a single cylinder, 4-cycle Diesel... developing 3¾ continuous horsepower at 1800 R.P.M. Standard equipment includes both hand and 12-volt electric starting. The engine—including power take-off and clutch—is complete, ready to operate, when shipped from the factory.

An indication of its economical operation is its fuel tank—it holds 9/10 of a gallon!

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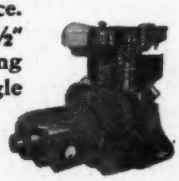
If you need a small engine you can install and forget—the new 3¾ H.P. air-cooled Sheppard Diesel is the one to remember. For complete information about this revolutionary new engine—mail the coupon today.



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R. Truzzie is superintendent for the contractor in direct charge of Contracts No. 2 and 3. M. N. Wise, vice-president, is general superintendent for the contractor.

The work is being done under the authority of the Kanawha County Court, which is composed of Carl C. Calvert, Mont. L. Cavender and J. G. Carper, with Dale Casto as counsel. Fred C. Alley is the representative for the county court, and is responsible for the early planning and location.

Value and Future Possibilities of Sludge as a Fertilizer

WRITING in the London *Contractors Record and Municipal Engineering*, a correspondent, signing himself "Impeller," recounts the extent to which well-digested sludge was used to aid the production of food in England during the war, when food supplies were short. While accepting the principle that use of the fertilizing values in sewage is but a secondary objective in sewage purification, and that the main objective must remain the part that treatment plays in maintaining public health and amenity through the removal and disposal of polluting matter and the control of disease by the suppression of filth, a clear picture is drawn of the biologic function of such recoverable fertilizing values.

During the war, a satisfactory and substantial market for sewage fertilizer was developed among farmers. The correspondent adds that this may be developed into a firmly established foundation on which to build further improvements. When the experience accumulated during the time of "blood, sweat and tears" has been studied and analyzed, many facts will become apparent and should be considered with all seriousness.

In viewing the facts as they have been developed so far, it appears obvious that well-digested sludge is the best part of sewage, considered as a fertilizer. Not always is this the result of a *planned* process. The fortuitous digestion in lagoons and on drying beds may produce an equally valuable fertilizer. A heavy trade-waste load can seriously reduce the value of the product, but an unmixed domestic sewage produces an easily dried, readily disintegrated material that is odorless, and possesses in an available form about 2% nitrogen, 1½% phosphate as P_2O_5, and a trace of potash.

On the other hand, a greasy, raw sludge has a disagreeable odor, and a relatively slight value, if used without drying and disintegration.

Hundreds of thousands of tons of well prepared sludge have been used in England as fertilizer during the last five years, and it seems important that some government agency should collect the full statistics of its use and the values attributable thereto. In all probability, as is noted, by far the greatest fertilizing values in sludge arise from body wastes. About 95% of the available fertilizer values are contained in the matter held in solution, and this is not recoverable (by any presently-known process). All in all, there is a loss of some 90% of the potential values in the raw untreated sewage, but even at this low figure of recovery, it is possible to reclaim 7,000 lbs. of fertilizing material per day from the sewage of each 100,000 population. This would mean we would recover 200 lbs. of nitrogen, 200 lbs. of phosphate, and possibly less than 20 lbs. of potash per day from the sewage of 100,000 people.

After pointing out the small amount of valuable matter reclaimed by our present processes, the correspondent suggests for consideration five possible methods of increasing it.

1. The utilization of the liquid effluent directly on the land. (The objection to this is the amount of water that must be disposed of.)

2. Evaporation of the effluent, which is regarded as impracticable, since less than ½ lb. of usable matter would result from the evaporation of a ton of effluent.

3. The use of certain "spot reagents," some of which are organic compounds possessing the power to precipitate one particular element. Such a reagent is "Cupferron," which is able to precipitate iron from dilute acid solutions—a reaction that has, of course, no value in sewage purification, but is mentioned as an example of the type of reagents that might be employed. The search for an organic which, in small amounts, could exert a similar power over valuable fertilizing values, is indicated.

4. The possibility of employing the base-exchange value of "zeolite," which was pointed out, *circa* 1850, by J. Thomas Way, an English consulting chemist.

5. It is suggested that refinements or improvement in some steps of the treatment process might result in a sludge unusually high in nitrogen. This high nitrogen content will probably result from the absorption by the suspended matter of the sludge in some still-unexplained manner, of this element from the liquid effluent. Undoubtedly some reaction of this nature does occasionally take place, for instances are not uncommon of sludge containing over 5% nitrogen—an unusual and unexplainable amount, if judged from the usual nitrogen content of sludge.

Parking Problems and Solutions

Detroit voters have approved construction in the downtown area of an underground garage designed to hold between 900 and 1,000 cars. The cost of the project, $1,816,000, will be met by revenue bonds which will be paid off in 18 years from parking fees. Rochester, Minnesota (26,312), recently paid $124,000 for a large area in the business district which will be redeveloped for use as a parking lot. Dallas, Texas, is considering the lease or purchase of land which in turn would be leased to private operators for parking lot purposes. To relieve rush-hour congestion the Dallas council recently prohibited parking on certain streets between 4:30 and 6:00 P.M. In Glendale, California (90,552), business and civic leaders have recommended that the city install parking meters and use the revenue to help pay the cost of acquiring off-street parking lots. St. Louis has tentatively approved a plan to construct two 1,000 car garages in the downtown business district. The city would acquire the land and the downtown merchants would defray the cost of construction of about $1,000,000 for each garage. Coos Bay, Oregon (5,259), recently established two off-street parking lots to care for the all-day parking needs of employees of business establishments, and has installed parking meters on business streets. Berkeley and Riverside, California, are considering proposals to establish off-street parking lots.—*Public Management.*

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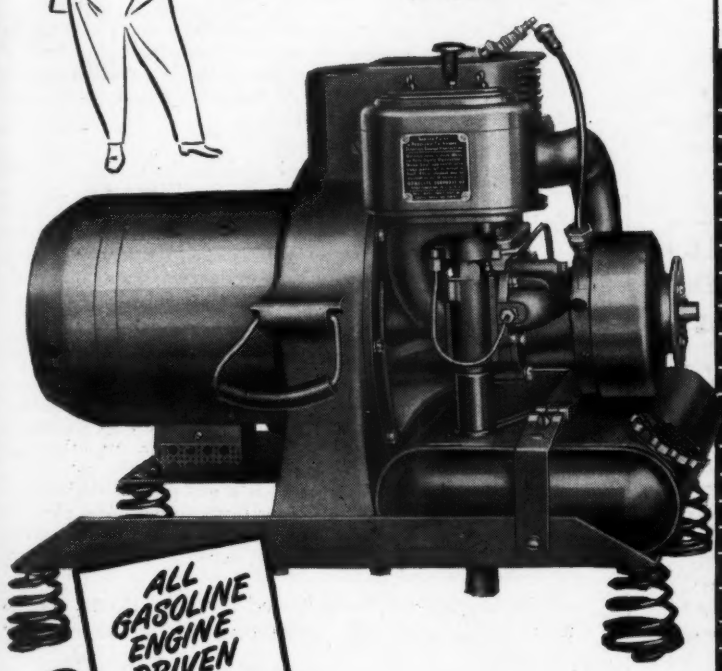

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25D120	120	33.4	4000
AC MODELS			
60 Cycle Single Phase			
22A115	115	4.3	500
23A115-11	115	8.7	1000
23A115-1	115	13	1500
21A115	115	15.6	1800
24A115	115	21.7	2500
25A115	115	34.8	4000
24A115/230	115/230	10.9	2500
25A115/230	115/230	17.4	4000
DC MODELS—Shunt Wound			
23D30	22-30	50	1500
24D30	22-30	83.3	2500
22D60	42-60	12.5	750
23D60	42-60	25	1500
21D60	42-60	33.3	2000
24D60	42-60	41.7	2500
25D60	42-60	66.7	4000
22D160	130-160	4.7	750
23D160	130-160	9.4	1500
21D160	130-160	12.5	2000
24D160	130-160	15.6	2500
25D160	130-160	25	4000
AC — 60 Cycle 3 Phase			
24A230	230	6.3	2500
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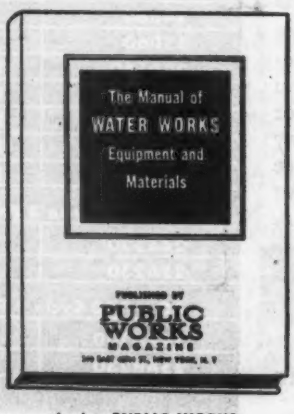

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Defining Engineer and Engineering

In connection with State laws for providing for the registration of professional engineers and land surveyors, legal questions have arisen concerning just who would be included under these titles. The several engineering organizations have endeavored to formulate definitions which would definitely and satisfactorily meet the legal requirements. The result of such effort is described as follows in the November issue of *Civil Engineering*.

New forms for the definitions of "Professional Engineer" and "Practice of Engineering" have been formulated and are in the process of being presented for approval to the various engineering organizations for comment and approval. The proposal originated in a conference held on August 28, 1945, at Society Headquarters. This meeting covered the subject of the Model Law for the Registration of Professional Engineers and Land Surveyors. It was widely attended—by representatives from all the national organizations closely affected.

The principal items to come out of this conference were the new definitions. Following discussion at the conference, it was recommended that the definitions be approved by the several organizations represented, in the following form:

"Definition—Professional Engineer:

"The term professional engineer within the meaning and intent of this Act shall mean a person who, by reason of his special knowledge of the mathematical and physical sciences and the principles and methods of engineering analysis and design, acquired by professional education and practical experience, is qualified to practice engineering as hereinafter defined, as attested by his legal registration as a professional engineer.

"Definition—Practice of Engineering:

"The term practice of engineering within the meaning and intent of this Act shall mean any professional service or creative work requiring engineering education, training, and experience and the application of special knowledge of the mathematical, physical and engineering sciences to such professional services or creative work as consultation, investigation, evaluation, planning, design, and supervision of construction for the purpose of assuring compliance with specifications and design, in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works, or projects.

"A person shall be construed to practice or offer to practice engineering, within the meaning and intent of this Act, who practices any branch of the profession of engineering; or who, by verbal claim, sign, advertisement, letterhead, card, or in any other way represents himself to be a professional engineer, or through the use of some other title implies that he is a professional engineer; or who holds himself out as able to perform, or who does perform, any engineering service or work or any other professional service designated by the practitioner or recognized by educational authorities as engineering."

This matter was considered by the Board at its Chicago meeting and the definitions were formally approved.

Ohio Resumes Striping of Highways

Percy T. Ford has asked for bids on about 14,000 gal. of white and yellow paint, slightly more than one-fourth the annual pre-war requirements, for restriping, and so reducing the hazards of winter driving on Ohio State Highways under his directorship. This post-war supply of paint will first be applied in the fog-areas which are not uncommon in that state.

Yellow lines are used to mark zones of "no-passing" restrictions and on horizontal and vertical curves. Approximately one-third of the striped pavement mileage is yellow, indicating the prevalence in Ohio of zones that call for care in driving.

Glass-beaded paint will continue to be used in those areas where the hazards are greatest.

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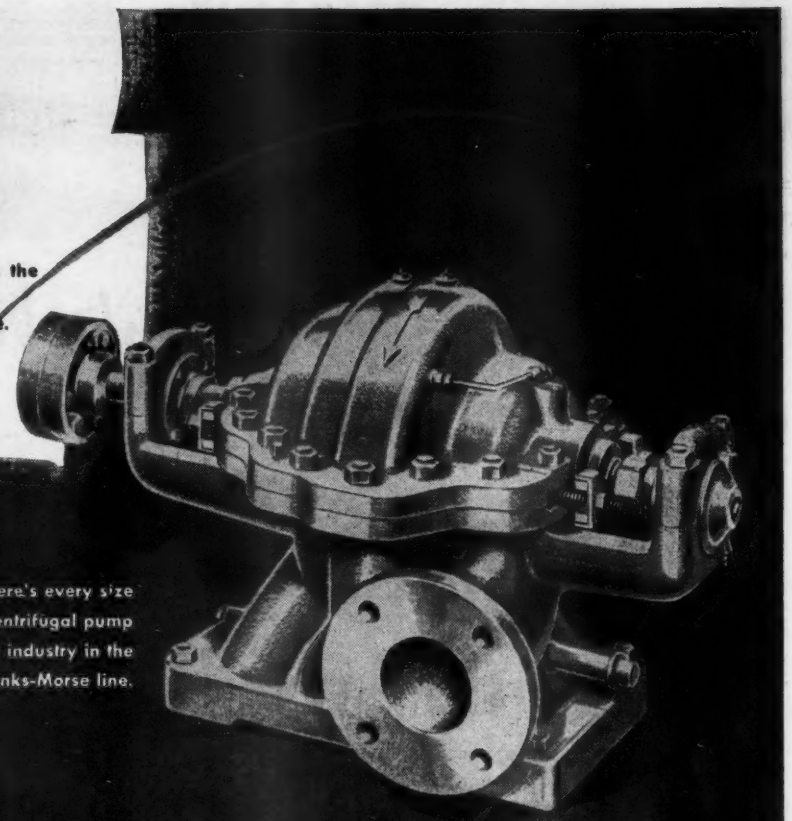

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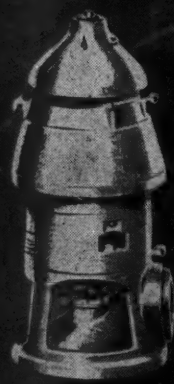

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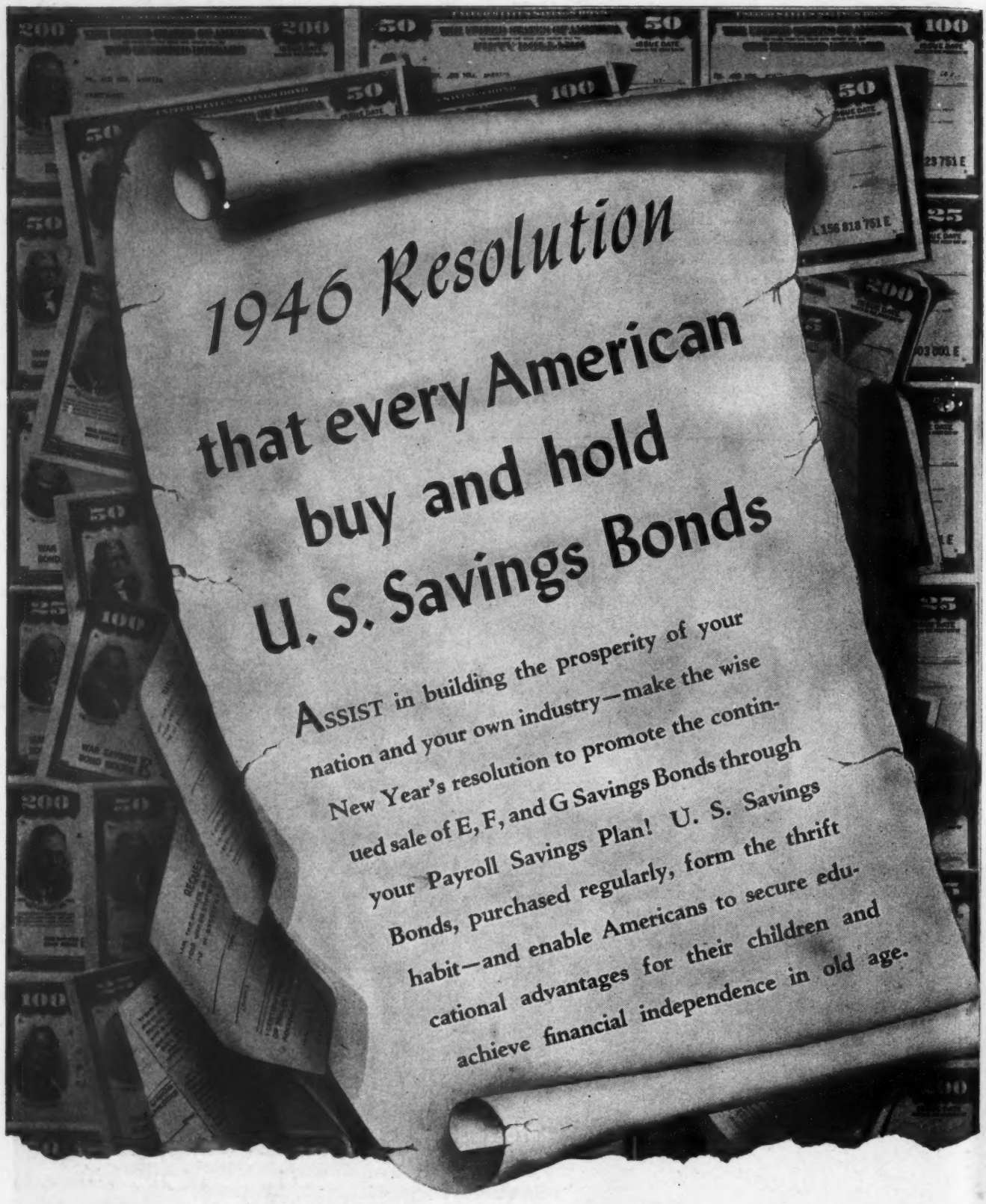
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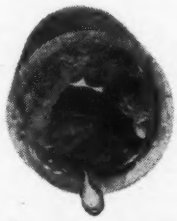

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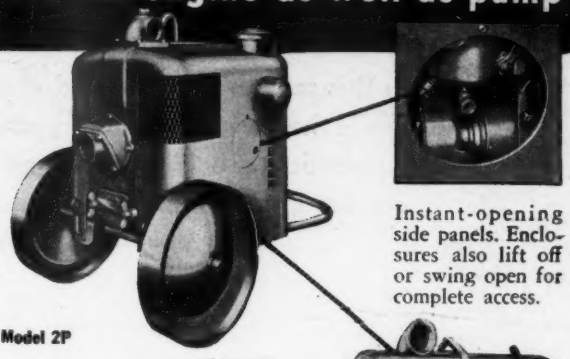

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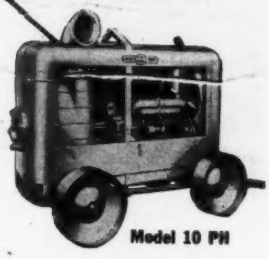

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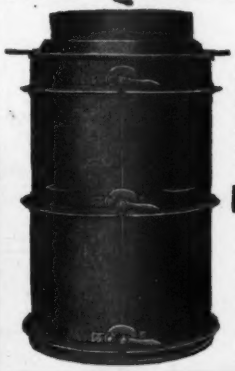

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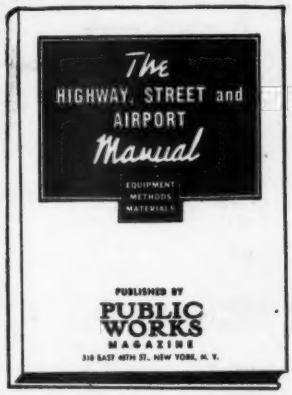

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Public Works Digests

Water Supply • Sewerage • Highways and Airports

In this section are digested and briefed the important articles appearing in the periodicals that reached this office during the previous month. Appended are Bibliographies of the principal articles, in which the articles in each periodical are numbered consecutively throughout the year, beginning with our January issue.

The letter and number at the end of each digest refer to those used in the Bibliography. Numbers not found in the current Bibliography will be found in the one published the previous month.

The Highway and Airport Digest

Designing for Pedestrian Safety

The extent of pedestrian fatalities on highways warrants great effort to reduce the number. Two major efforts needed are: (a) A continuing and intensive campaign of safety education for both motorist and pedestrian, and (b) a greater degree of attention to pedestrian needs in planning and engineering rural highways. The latter includes providing pedestrian walkways at all points where conditions furnish an economic warrant; and designing pavement surfaces so as to eliminate glare to the maximum degree possible. Also, certain locations may demand special lighting treatments, or pedestrian overpass or underpass crossing structures.

Entrance and exit facilities to roadside establishments should be localized, and intersections and other points where pedestrians must traverse comparatively long distances should be provided with islands or places of refuge.[O3]

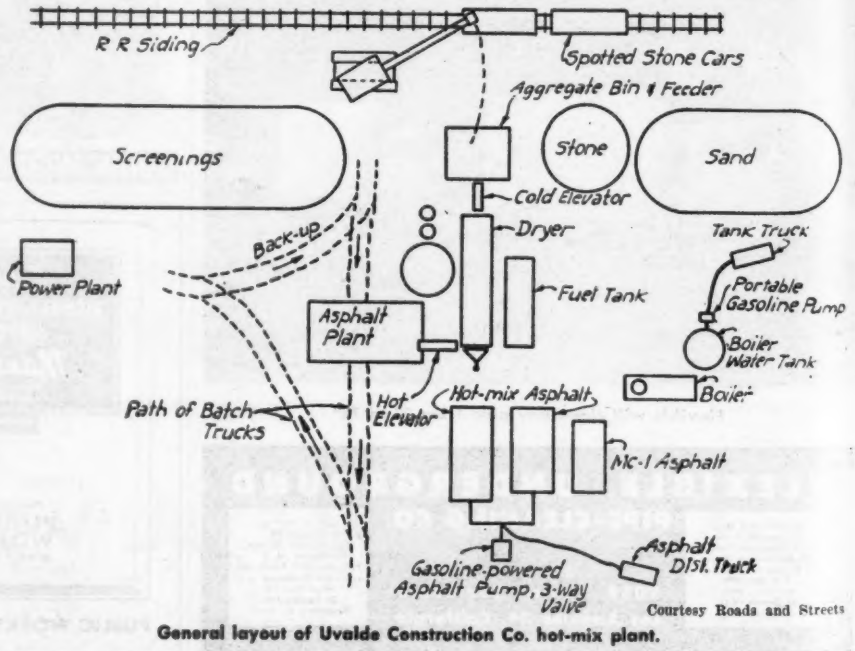
Good Equipment For Pavement Repairing

Gumbo subsoil under a gravel and asphalt-surface runway in Texas caused it to fail under heavier planes than were anticipated. In replacing 76,000 sq. yds. of the runway, the asphalt surface was stripped off, using heavy motor graders, and 8" depth of gravel was scarified and windrowed. The exposed subbase was scarified with heavy sheepsfoots, and the windrowed gravel was spread back mixed with 10% portland cement, and rolled thoroughly. Cement was delivered in bulk and placed by a belt-type mechanical spreader, which spread the 5.64 lb. per sq. yd. within 0.04 lb. per sq. yd. This was rolled with sheepsfoots followed by a flat roller. Immediately afterward a tack-cure coat of MC-1 asphalt was placed at 140°F.

The hot-mix surface required 9,000 tons of plant mix, to be completed in 14 working days. A single spreader was used, fed by dump trucks carrying 10,500 lb. batches. The plant used by the contractor (the Uvalde Construction Co.) was a 120-ton per hr. plant, consisting of a 3-compartment receiving bin with proportioning feeder, cold elevator, dryer, enclosed hot elevator, dust collector, and asphalt plant including shaker screen pug mill and weighing bin. Batches were 3500 lb. Ten electric motors were required to operate the plant.[N5]

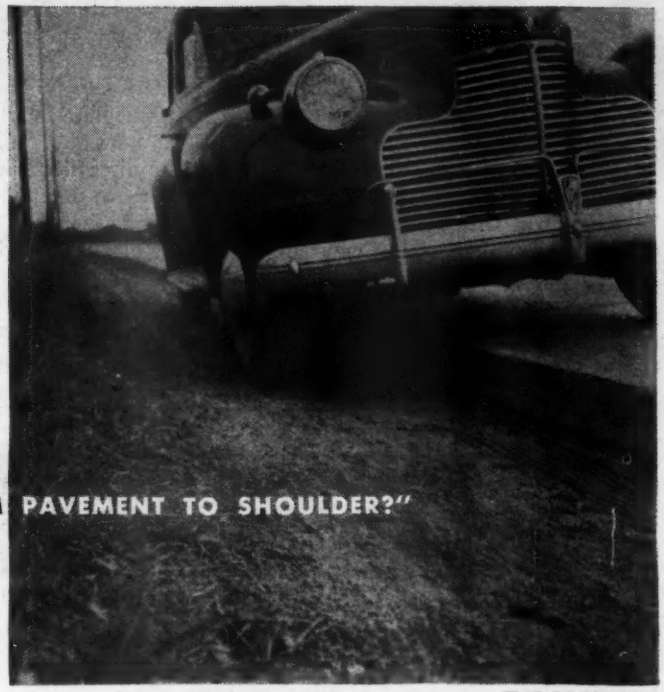
Quarrying Stone For Highways

(From a recent maintenance manual of the West Virginia State Road Commission.) When quarrying stone is contemplated, the following important factors should be given careful consideration: 1—Selection of quarry site. 2—Amount and quality of stone. 3—Amount and character of overburden. 4—Initial cost of putting quarry in



Courtesy Roads and Streets

General layout of Uvalde Construction Co. hot-mix plant.



THE PROBLEM

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operation. 5—Storage facilities. 6—Accessibility to points of use of stone. 7—Methods of operation. 8—Economy of operation. 9—Safety of operation. 10—Agreement for use of quarry site.

Each of these factors is developed at length in the manual.[R5]

Traffic Planning In American Cities

Funds provided by the new legislation, and general recognition of the necessity of solving the more critical city traffic problems by large-scale, bold and costly improvements, assure large city programs. Recognizing that the methods used in rural-road analysis and those generally used in city planning in the past are not adequate for the solution of problems now at hand, the Public Roads Administration has made special studies of methods of accumulating the data needed for scientific planning of urban highways.

Studies have shown that bypasses which have been built around cities often have not been justified, as most of the traffic approaching a city wants to go into it and a bypass solves only a small part of the problem. Figures from traffic censuses indicate that for cities of over 500,000 population, about 96% of the approaching traffic is bound for the city, whereas for cities of from 10,000 to 25,000 the corresponding figure is about 79%. Smaller cities frequently need bypasses because they will contribute materially to the relief of traffic congestion within the city.

Traffic within an urban area is much more complex than that on rural roads. Traffic volumes are larger, and traffic arteries are much more numerous. Parallel streets offer many alternate routes of travel, and it is not possible to tell from observing traffic volumes alone where the drivers really want to go. It was believed that the best method of making urban traffic studies was to interview occupants of dwellings according to a standardized method of sampling, and to determine the travel by automobile or by public conveyance by each resident of the dwelling unit on a representative weekday. Owners of trucks are asked for information concerning all of the trips made by each truck on a given day.

The most useful tabulations made from survey data show the number of trips daily from one zone to another by automobiles, trucks and passengers in automobiles and public transit vehicles. From these tabulations determination can be made of routes that will best serve traffic needs, and the traffic volumes to be expected on new facilities which may be constructed. When properly analyzed and interpreted, the survey data give all of the information needed to compare a route with any other route as regards traffic service, to determine the design volumes for different sections, and to determine the needed locations and capacities of the interchanges.[U2]

Replacing a Displaced Pier

A two-lane highway bridge crosses the outlet of Saratoga Lake with three 200 ft. spans of steel trusses, built in 1923. Ice from the lake piles up against the piers in the spring break-up, and by 1937 the north pier had moved 1.7 ft. down stream, and by May, 1942, it was 2.8 ft. out of line and had settled 0.2 ft. Investigation showed that the pier was founded on vertical piles in clay and sand, with no batter piles. Traffic on the bridge could not be discontinued and piles could not be driven under the bridge, where the water was 33 ft. deep. The plan of repair adopted was to drive a temporary group of 12" pipe piles

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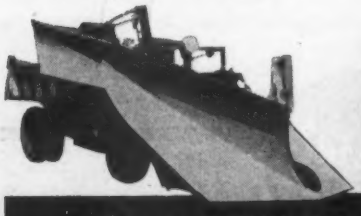

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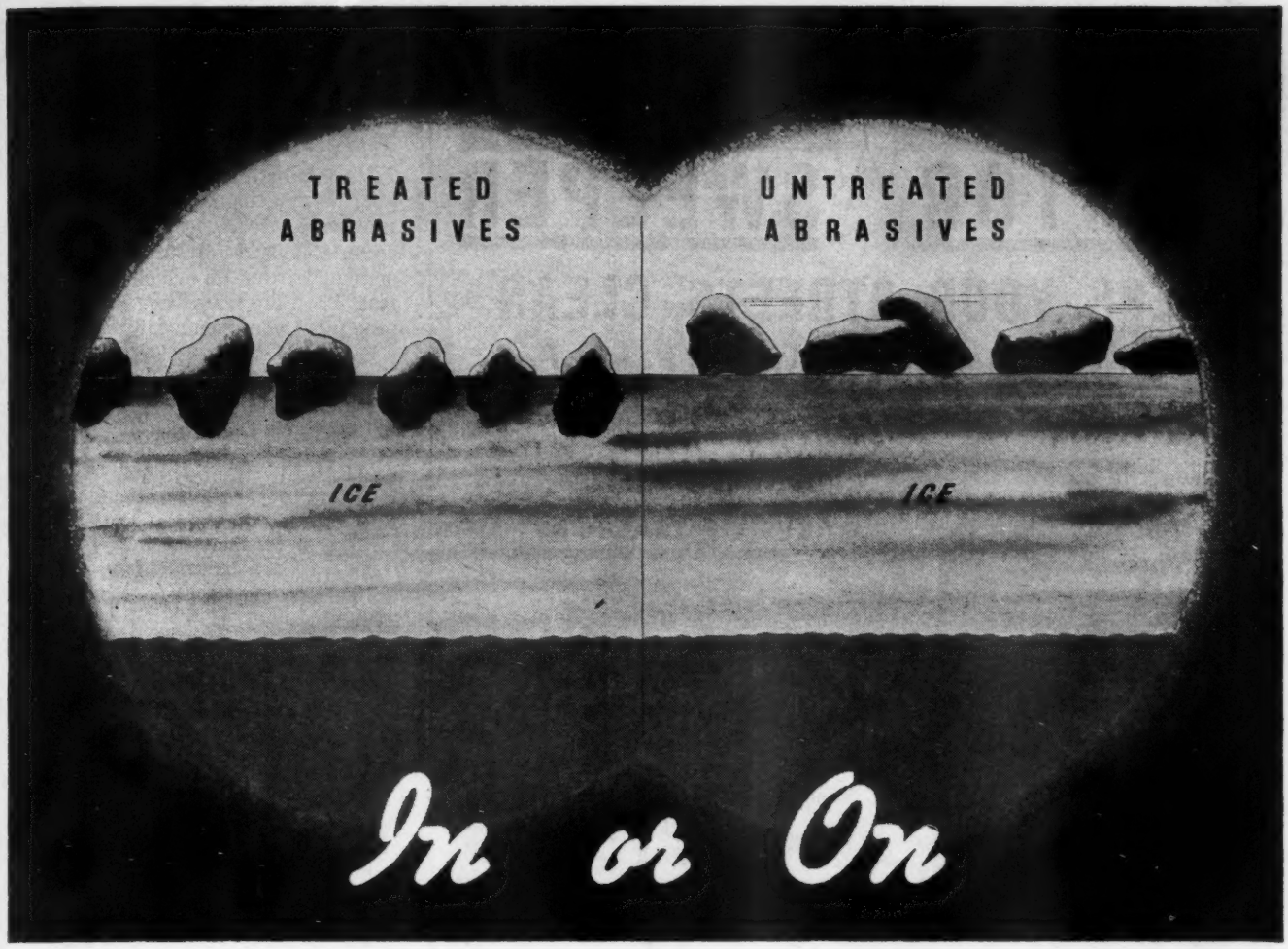

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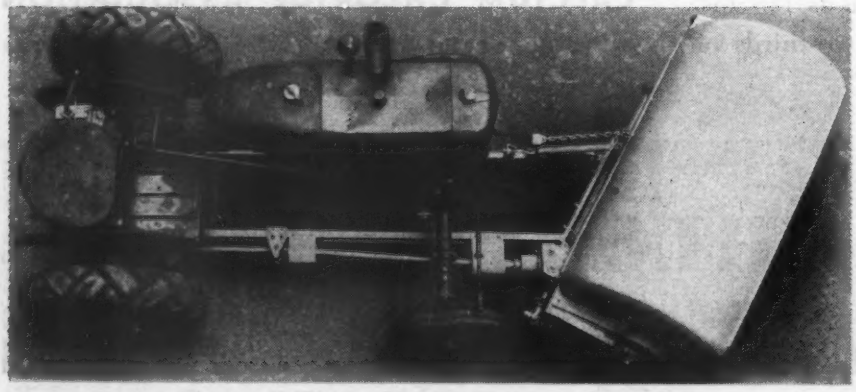

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at each end of the pier, as close to the trusses as possible, to support built-up steel box girders under the trusses; jack these girders and the trusses up to the proper elevation; slide the trusses to correct alignment. Then groups of steel H-piles 120 ft. long were driven, part of them battered up stream, capped with concrete, and used for support of a permanent girder on which the trusses rest. Then the temporary girders and pipe piles were removed.[81]

Limited-Access Expressways in Texas

In designing the urban links in Texas of the interstate highway system under the Federal Highway Act, the State Highway Department has adopted the following guiding factors: 1. Urban sections of interstate highways through large cities are primarily local carriers; a great preponderance of arterial traffic approaching them is headed for the business center. Hence the state's decision to build urban routes directly through the city, leaving to any belt highway development the secondary function of carrying vehicles headed on past the city. Routes have been selected which roughly quarter the city area, intersect near the downtown district and flank that district on two sides. These routes will serve much regional traffic, relieve adjacent city arterials and speed up commuter and other local traffic generally.

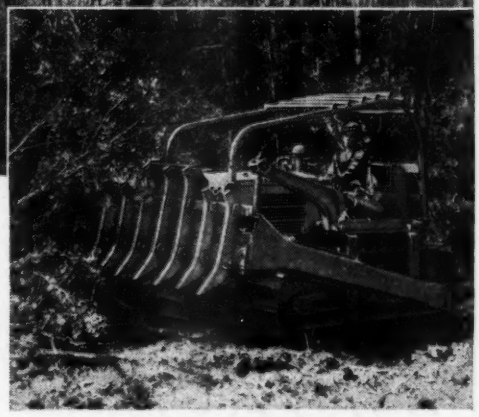
The locations were selected after extensive studies of the local industrial and transportation pattern; available traffic data; origin and destination studies; zoning, right of way, recreational and other factors. 2. The new arterials in each instance are being designed *from the center of the city outward*. This is in contrast with traditional practice of building the first sections of urban arterials in suburban areas where right of way is cheapest and most painlessly secured. Immediate construction in each city will provide several miles of limited-access highways along two areas, flanking the central area on two sides.

In setting up the general directive for these projects emphasis was placed on three musts. One, there must be sufficient width to meet future traffic-lane, service road and access needs (160 ft. general minimum right of way was made the working basis). Two, there must be controlled access. Three, private enterprise is to be encouraged to develop ample off-street storage or parking facilities in the central area.

Houston's project No. 1 comprises 3.7 miles of divided, limited-access design, estimated to cost about $4,000,000; to provide two 36 ft. express roadways and two 32 ft. service roads, with seven grade separations. Two other projects will be ready for contract in about a year.

Dallas proposes 10.05 miles of highway 160 ft. wide, to cost $7,000,000.

San Antonio has voted $1,750,000 to



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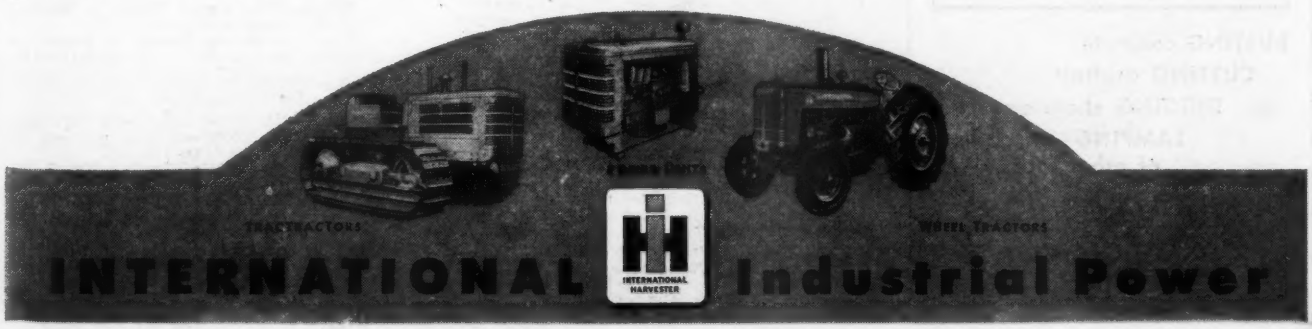

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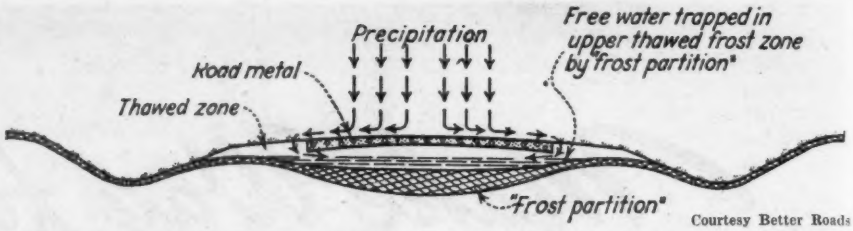

Courtesy Better Roads

Cross-section of road showing location and shape of "frost partition," and course of precipitation into upper thawed zone under road metal. Free water is trapped following early "deep freeze."

purchase right of way for 6½ miles of immediate expressways and connections, which will cost some $6,500,000. These plans assume 60 mph traffic in urban sections and 75 mph in outlying sections; a maximum curvature of 4°; maximum 5% grade.

Fort Worth's first project will include 3 miles of 6-lane east and west, and 6 miles of 2-lane north and south, with 370 ft. right of way for 4,000 ft. in the most congested area and 210 ft. elsewhere.[N1]

Cause of Spring Break-up

The extent of spring break-up varies from year to year. This is determined by the time of the first "deep freeze"—frost so deep in the soil that it does not entirely leave until spring. Water entering the soil after that stands above the frost partition until this has thawed. It is found that this frost partition is deeper in the center of the road than in the shoulders, forming a trough which holds the water. If the deep freeze does not occur until after the rains of early winter are over, there may be little water accumulation above it. The soil above the frost partition freezes also, and prevents damage by the stored water until the top 12" to 15" is thawed, or unless loads on the roadbed are so heavy that this frozen roof can not support them.

Three remedial measures are proposed: 1—Place a line of longitudinal drain pipe in the center of the road not more than 15" below the surface. 2—Make the shoulders impervious to water, so all precipitation will be carried to the roadside ditches. 3—Dig holes with a post-hole digger and backfill them with a mixture of coarse gravel and chloride; 25 lb. of chloride per hole will assure results for several years.[R3]

Bibliography of Highway Literature

c. indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

J *American City*
December
1. Build Soil-Cement Streets in Summer. By L. C. Bailey. P. 99.
2. Mud Jacking to Lengthen Pavement Life. P. 105.

L *Civil Engineering*
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1. Heavy Grading Required for Airport at Charleston, W. Va. By L. S. Wescott. Pp. 553-555.

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2. How Parts of Large Pin-Connected Truss Were Replaced Without Falsework. By H. S. Rockoff and F. Howard Stowell. Pp. 69-72, 89.
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5. Raising Sagging Pavements and Runways. By Hugh A. Wallace. Pp. 65-67, 100.
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1. Leveling Mountains for an Airport. Pp. 36-37.

R *Better Roads*
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2. Federal-Aid Funds Will Round Out Modern Highway Program. By G. W. Deibler. Pp. 17-18, 46.
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S *Construction Methods*
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2. Traffic Planning Studies in American Cities. By John T. Lynch. Pp. 161-178.

W *California Highways and Public Works*
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2. Highways of California. By J. D. Gallagher. Pp. 5-11.
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4. Eel River Training Jetties at Shively Bluffs Combat Floods. By L. R. Redden. Pp. 21-23.
5. Record Storm Hits District IX. By J. M. Hodges. Pp. 24-25, 34.

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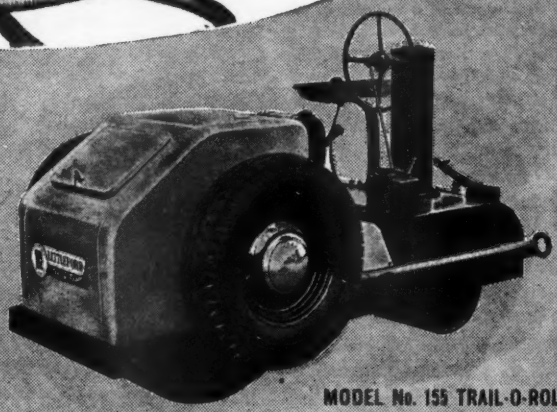

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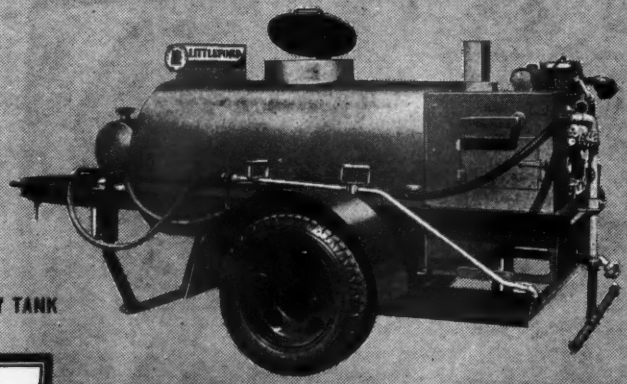

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The Sewerage Digest

Control of Sludge Index by Chlorination

Investigations were carried on for three years at three army camps, one in the southeast, one in the northeast and one in the midwest, to learn the possibility of controlling the sludge index by chlorination of the return sludge, the method of control, and the dosage necessary.

All the northeastern plant chlorine was applied in both the return sludge and in the aeration effluent. Either point of application resulted in an improved index, but that in the return sludge gave comparable results with half as much chlorine as was needed in the aeration effluent.

At the southeastern plant, chlorination of the return sludge reduced the index from 993 to 242 and improved overall operation, enabling an overloaded plant to produce an effluent of 14 ppm B.O.D. with an average reduction of 95%.

At the western plant chlorine was applied to the return sludge in amounts varying from 13 to 48% of the demand, or, on a dry solids basis, between 0.05 and 0.61%. Best reaction in sludge index improvement was obtained when the chlorine dose was fitted to the sludge index and based upon the amount of dry solids in the return sludge. When lower dosages of chlorine were used the reaction was favorable but took several days longer to become effective.

It was found that the pounds of Cl_2 per day required to control bulking adequately can be expressed as 0.0000834 SFW, where S is the sludge index (Mohlman), F is the return sludge rate in mgd and W is the suspended solids in return sludge in ppm. The best point of application of the chlorine is in the return sludge at a point which will allow 2 to 3 minutes contact period.[C95]

Operating Activated Sludge Plants

The most important variables under the control of the operator are: 1—Volume of air applied. 2—Concentration of suspended solids in aeration tank. 3—Aeration period. 4—Rate of sludge return. 5—Condition of the sludge.

The air used may range from about 350 to 2,200 cu. ft. per pound of 5-day B.O.D. removed. A dissolved oxygen content of 2.0 to 5.0 ppm is generally required at the outlet end of the aeration tank. No. 2 is one of the most important factors in operation. No fixed amount is optimum for all plants, nor in a given plant at all times.

3—This is most commonly 4 to 6 hours. Long periods usually produce a high degree of purification, with oxidation of nitrogen into nitrates. Nitrates stimulate growth of algae and other aquatic plants in the outlet water course, which may be undesirable; but long aeration periods make the plant easier to operate.

4—This usually varies from 20 to 45%. It is the pounds of solids returned to the aeration tank rather than the volume which must be controlled.

5—The "sludge index" is computed by dividing the percentage of aeration tank suspended solids by weight times 100, by the volume of sludge settled in 30 minutes, also expressed in percent. Sludge index values above 1.0 (Donaldson); or (Mohlman index) the volume is milliliters occupied by one gram of sludge after 30 min. settling, calculated by dividing the volume of sludge in percent after 30 min. settling by the weight of suspended solids in percent. Values less than 100 Mohlman are considered satisfactory.

Samples of sewage and effluents should be taken at least every hour, kept cool and analyzed as soon as possible.

Routine tests should include determinations of D.O. and suspended solids in the aeration tank; settling tests of aeration tank effluents; centrifuge tests as a rapid check on concentration of sludge; depth of sludge in concentration tanks. Most other tests require such a long time as to be of little use in plant control.[C100]

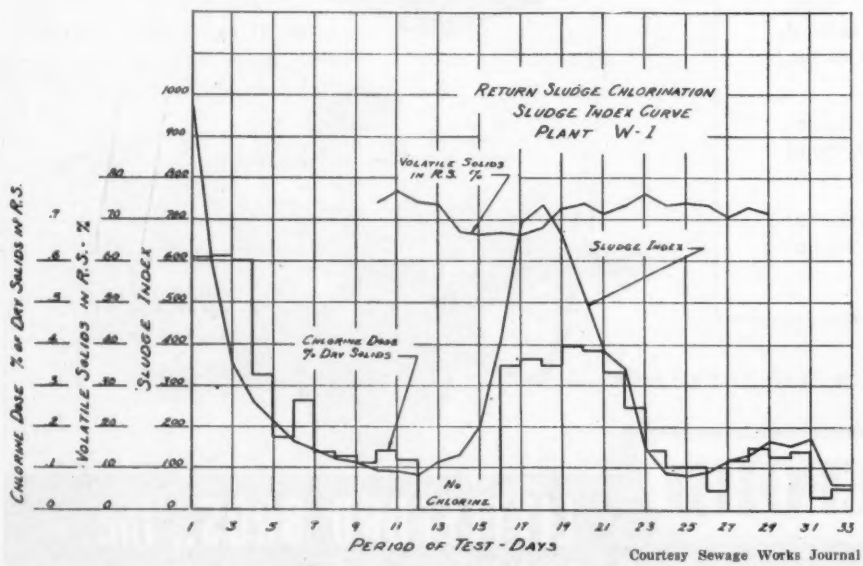
Sludge Drying

Drying by whatever method is preceded by sludge digestion, chemical coagulation, elutriation, or thickening, to promote rapid separation of solids from the liquid. In the case of vacuum filtration of sludge, digestion provides storage for sludge less odor, longer cloth life, more uniform feed for incinerators, reduced sludge volumes, and frequently reduces amount of chemicals needed for coagulation.

Chemical coagulation is necessary in vacuum filtration, and sometimes desirable in dewatering on sand beds. Elutriation washes out soluble amino and ammonia compounds in the sludge, thereby reducing the amount of coagulants used.

Dewatering may be effected by drying on sand beds, vacuum filtration, mechanical presses, or centrifuging. With heat, sludge can be dried to 10% or less of water, or can be incinerated.

In drying on beds, the best dosing depth is generally 8" to 10". Increasing depth increases drying time. In average good drying weather, 8" of digested sludge of 5% solids can be forked in about a week, while 8" of 8% solids will require about two weeks. Depth of 10" will require an additional time of 3 days and 9 days respectively. Wet sludge should never be applied over partially dried sludge. If alum is applied to sludge as it is discharged onto a bed at the rate of 6 to 10 lb. per 1,000 gal., drying is hastened, the sludge is less affected by rain, cracks sooner and contains a higher percentage



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Effect of chlorination on sludge index at the western plant.

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of solids. Enclosing beds with glass reduces odors, aids drying in the spring and fall, makes winter cleaning of beds easier; but may retard evaporation in summer.

Vacuum filters will undoubtedly be improved by making the interior piping more accessible for cleaning or replacement; by abandoning wire wrapping of the cloth; and by substituting transverse for longitudinal agitation in the filter vats. Mechanical pressing and centrifuging are little used.[C99]

Sludge Gas Utilization

In operating a sludge gas collection system, the gas piping should be flushed occasionally with water, or disconnected, to remove deposits. Gas meters should be cleaned yearly and moving parts lubricated. Condensate traps should be cleaned yearly and checked periodically for leaks. Flame traps should be inspected yearly and the flame element soaked in dilute hydrochloric acid and rinsed, and the shut-off mechanism lubricated.[C99]

Treatment Without Digestion

Supernatant liquor from a digester is usually strong and the organic matter in it difficult to handle. In the digester, the bulk of the organic matter is broken down in such a way that the carbon is liberated as carbon dioxide or methane, but the nitrogen is liberated as ammonia, which may be left in the supernatant and carried back into the raw sewage and escape in the effluent and act as fertilizer in the stream. The authors believe that "These facts indicate that once the organic matter has been precipitated in the form of sludge, this should be removed and disposed of in such a way that the nitrogen contained therein is not returned to the sewage." Seven plants have been built embodying this idea during the past six years, consisting of a fine screen, aero-filter and final settling tank; the screenings and settlings being pumped to a small tank where they are treated with ferric chloride. The sludge is dewatered on sand beds. The fine screen removes about 10% of the B.O.D. The filter, if single-stage, produces about 85% over-all removal, or 93% if two stage. The settlings are mixed with ferric chloride and dried on sand, and can be forked off in 4 to 6 hrs. and used as fertilizer. The elimination of Anaerobiasis in the plant appears to have eliminated a large amount of the corrosion; the plants have been free from faulty biological activity. The entire plant can be housed in an attractive building. H 2

Resurfacing Concrete in Sewage Plants

In the two treatment plants of Greenwich, Conn., disintegration of concrete in the tanks became so pronounced as to threaten their stability. Of three tanks built in 1917, one was used as a digestion tank and the others for sedimentation tanks which were cleaned at 3 or 4-month intervals, during which hydrogen sulfide was formed. In one of the sedimentation tanks the roof beams were so disintegrated that the reinforcement was exposed, and in the 6″ roof slab the concrete was soft for 1″ depth. Side walls and baffles above the flow line showed a maximum removal of concrete of 2″ and 1″ additional was soft. Below the flow line the disintegration was not so great. The digestion tank was in much better condition. Only a little of the concrete in the roof was missing, but it was porous for about ½ inch. Side walls above the flow line showed removal of about an inch and a similar depth of soft material. Below the flow line, concrete removal was negligible, but it was porous in spots. The chlorine contact tank showed the greatest disintegration of all, concrete removal varying from 1″ to 3″, being most severe above the flow line. Disintegration below the flow line is attributed to the 0.5 to 1.0 ppm residual chlorine in the effluent.

In repairing the tanks, gunite was used. First all porous, soft or calcified material was removed by sand blasting and clean, solid, rough concrete exposed. Loose sand and dust was removed by air blast. Where the thickness of the gunite exceeded 1″, mesh reinforcement was anchored to the old concrete by ex-

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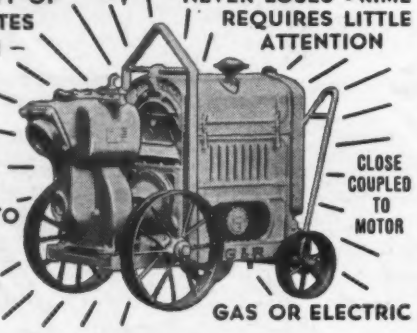

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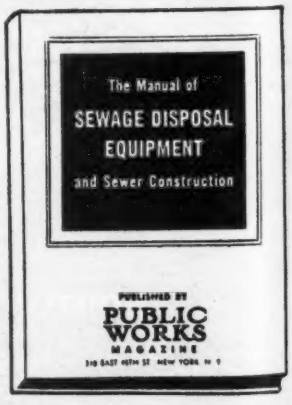

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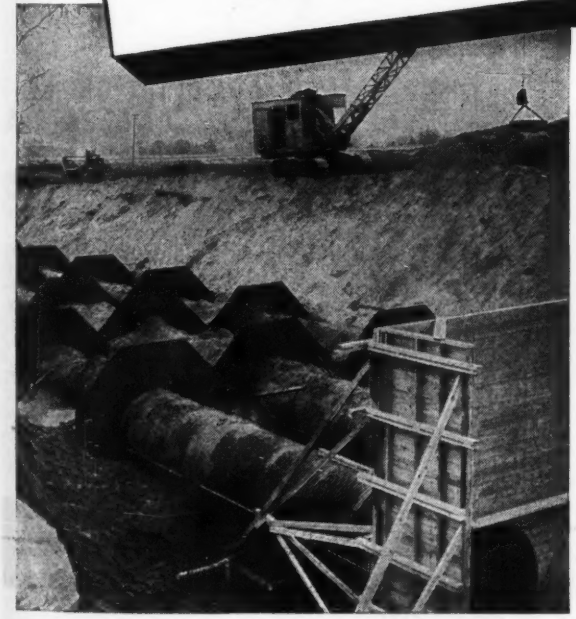

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pansion bolts. A gunite mix of 1:3 was used—1:2 shrinks and pulls off. A smooth steel trowel finish is desirable. The cost per sq. ft. gunited was from 93 cts to $1.13. H 57

A Sewage Plant Garden Spot

New London, Conn., built a sewage treatment plant and incinerator about 4 years ago, and began beautifying the grounds. The first year they placed about 10,000 flower plants, and in 1945 had over 20,000, and raised 30,000 for seed. In 1944 they built a pool spanned by a rustic bridge and containing a sprinkler, and edged with flowers which bloom progressively from earliest spring to frost. Along the enclosing fence is a flower bed 5 ft. wide containing 5 rows of flowers. All these flowers were raised from seed. Two men 60 to 70 yrs. old do all the planting, transplanting and setting out and taking care of the flowers and lawns. The flowers are started in a glass-covered sludge drying bed the first of March. Sludge is used as fertilizer, turned into the ground in the fall. H 58

Bibliography of Sewerage Literature

c. indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

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1. Percolating Filter Scheme for Universal Operation. By L. B. Escritt. Pp. 711-713.

G *Water Works and Sewerage*
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1. *p.* Operation of Activated Sludge Plants. By Gail P. Edwards. Pp. 311-316.

H *Sewage Works Engineering*
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1. Gas Engines Work at Madison. By John C. Mackin. Pp. 610-613.
2. Sewage Treatment Without Digestion. By H. O. Halvorson and Randolph L. Smith. Pp. 614-615.
3. Design and Operation of Modern Refuse Incinerators. By Henry W. Taylor. Pp. 616-618.
4. *p.* Effect of Industrial Wastes on Sewers and Sewage Plants. By John H. Ashley. Pp. 619-620.

J *American City*
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1. Iron-Bound Sewage. Pp. 96-98.

M *Water and Sewage*
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1. *p.* Sludge Disposal at Detroit. By Clarence W. Hubbell. Pp. 51-52, 90.
2. *p.* Incineration of Sludge Meets Detroit Conditions. By L. V. Garrity. Pp. 53, 84.
3. *p.* Design and Operation of Sewage Pumping Stations. By W. S. Lea. Pp. 56, 72.
4. *p.* Lack of Digester Capacity in Sewage Plants. By R. A. Greene. Pp. 57, 92.
5. *p.* Certification of Sewage Plant Operators; Is It Justified? By W. F. Shephard, Pp. 58-59, 86.

P *Public Works*
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1. *c.* Repairing a Sewer Laid in Quicksand. By R. G. Coulter. P. 19.
2. *p.* The Future of Sewage Treatment. P. 21.
3. *t.* Review of Army Sewage Treatment Problems and Results. P. 24.
4. *n.* DDT Kills Filter Flies. P. 42.
5. *t.* Use of Sodium Nitrate for Treating Cannery Wastes. P. 48.
6. *t.* The Sewerage Digest.

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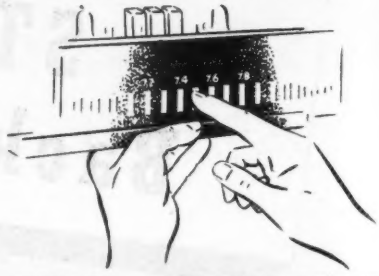

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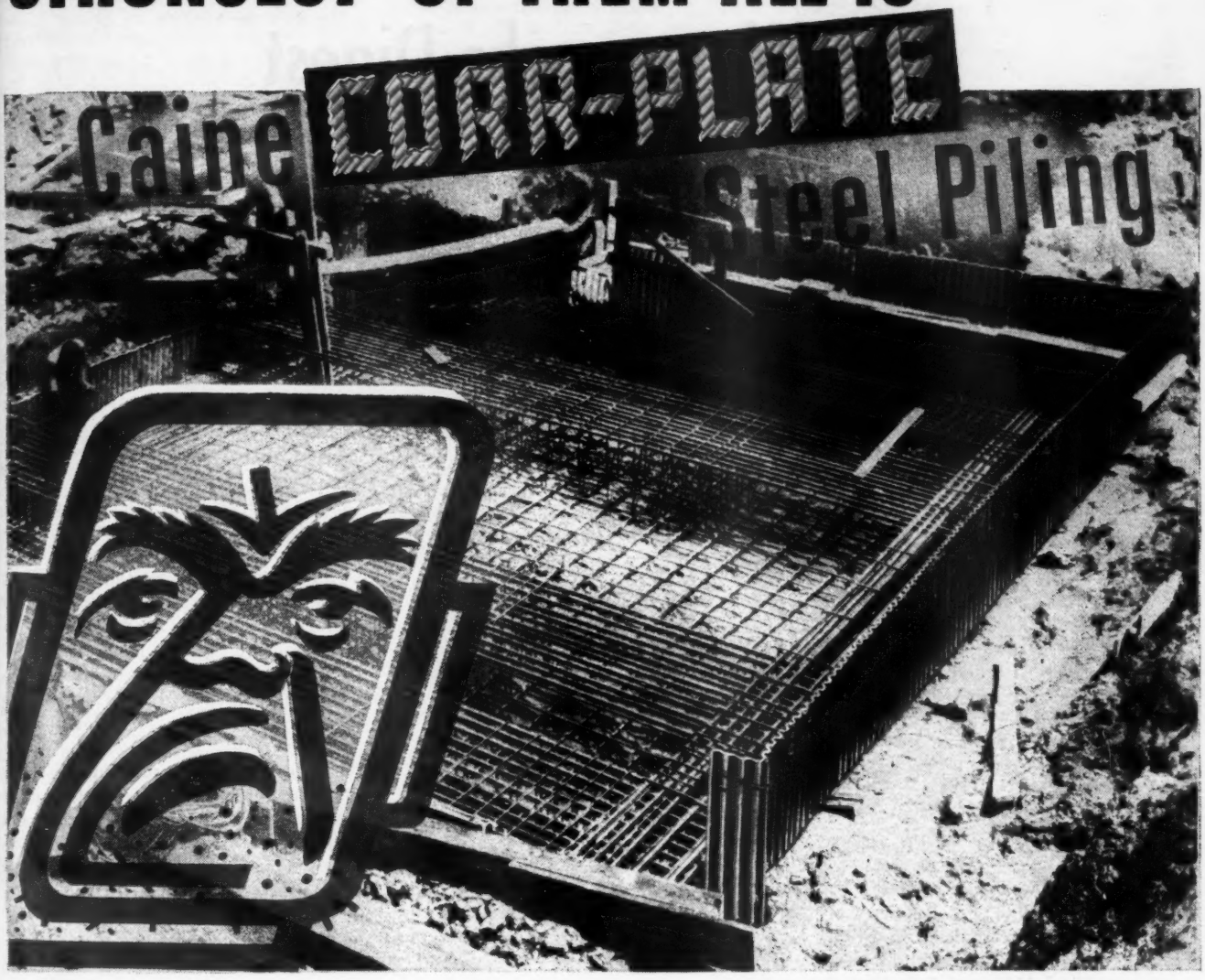

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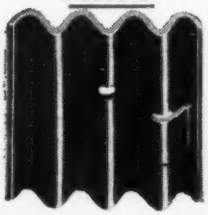

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The Waterworks Digest

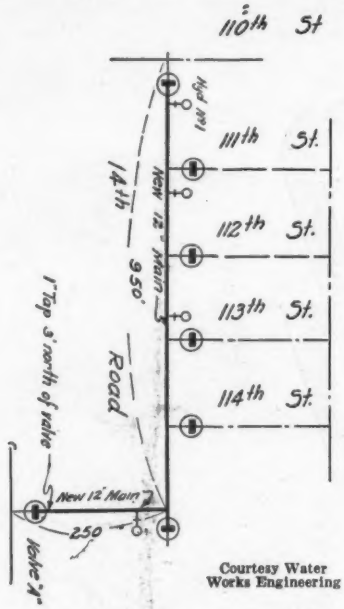
Sterilizing Water Mains

The Bureau of Water Supply of Queens, New York City, has adopted a rapid plan of disinfecting water mains. A 1200 ft. line of 12" main was sterilized in less than three hours, including the time to excavate and install a 1" tap just ahead of the valve through which water was admitted to the section, the turbulence there mixing the chlorine with the water. The dose, and the rate of flow of water through the main to the outlet from a hydrant at the further end, were adjusted to give 50 ppm of chlorine. High-test hypochlorite in a 13,000 ppm solution was pumped into the main through the tap at the calculated rate and the flow of water adjusted by the valve. When the flow from the hydrant contained 40 ppm of chlorine, the hydrant and valve were closed and the pipe stood full over night, when the line flushed until no free chlorine was found in the discharge. The test showed zero B. Coli.[F65]

Geist Reservoir At Indianapolis

This reservoir was built as a result of studies begun in 1923; construction was begun in 1941 and completed in 1944. The capacity is 6,900 mil. gal. and the area covered is 5,455 acres. It is formed by an earth dam 1900 ft. long, 40 ft. high above the valley floor. The cost, including land, was $2,500,000.

A thorough investigation preceded the actual planning. The flow of the stream, Fall Creek, had been measured by an automatic water level recorder, and evaporation at Indianapolis measured by the U. S. Weather Bureau. Mass and draft curves for 1930 and 1931 were drawn and the maximum ordinate between them found to be



Layout of 12" main used to test rapid method of sterilizing mains.

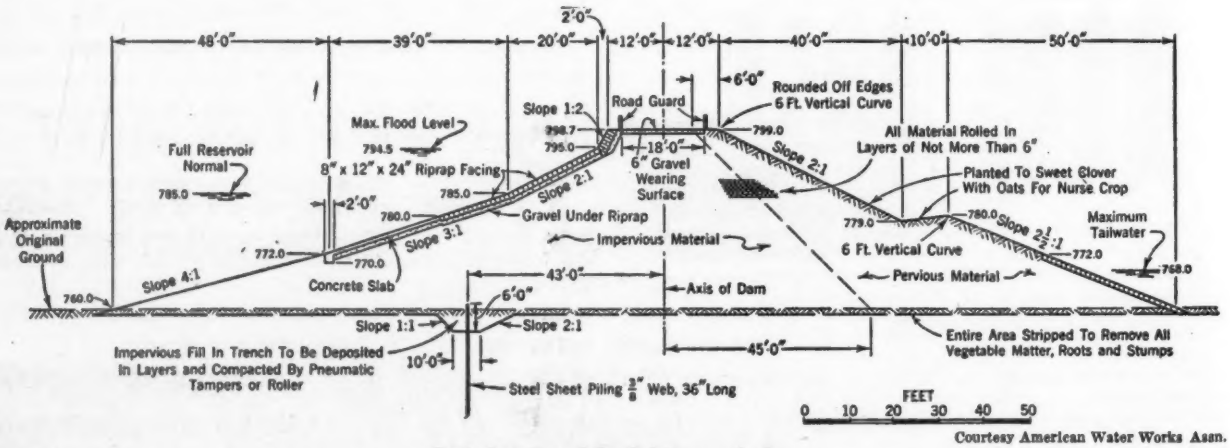
6,900 mil. gal. Subsurface borings were made on and near the proposed axis of the dam and the State geologist was consulted on the suitability of the site. Bed rock was excessively deep, so earth fill was adopted, with a sheet piling cut-off wall extending across the valley. The spillway was designed to carry 2½ times the amount that the stream was estimated to have flowed during the greatest flood on record in that section of the country. The design of the spillway, pool and apron was based upon tests of a model made at a testing laboratory of the U. S. Bureau of Reclamation.

The article describes all these in detail, and also the construction of the dam.[A11]

Legal Control Of Ground Water

Among the ways of conserving ground water are control of leaking and flowing wells, of surface streams, and of the use of ground water by the public; reforestation; recharging, and re-use by cooling. While a few fundamental principles concerning the legal status of ground water are being recognized, there is a wide difference of opinion when it comes to litigation of groundwater questions. Both English and United States courts have recognized three classes of ground water—subterranean water courses, artesian waters and percolating waters. In legal actions, ground water is presumed to be percolating water unless the boundaries and banks of an underground water course are definitely established.

Many states have adopted as a basic principle of law the doctrine of "reasonable use"—that a man's right to the use of ground water under his own property is limited by the similar right of his neighbors. California developed from this a "doctrine of correlative rights." New Jersey and New York laws provide that new or additional de-



Courtesy American Water Works Assn.

Typical section of the Geist reservoir dam

velopments of either surface or underground water for public supplies, by municipalities or private water companies, cannot be made until they are approved by a supervisory body.

The doctrine of "appropriation" is recognized in several of the western states whose constitutions carry clauses stating in effect that all of the waters of the state belong to the public and are subject to appropriation. Most of the states, however, have no policy of controlling water.[W4]

Handling Winter Problems

Bismarck, N. D., has a 4.5 mgd filtration and softening plant. The main building has storm windows and storm doors and is heated by a steam boiler thermostatically controlled to maintain 55° temperature, aided by heat from the CO_2 boiler used for recarbonization. A basin used for presedimentation in summer and softening in winter is housed in a separate building, which is kept at 40°F. by thermostatically controlled gas heaters. Sewer lines from the plant have flap valves which remain closed when no water is flowing, preventing cold air from entering the plant.

The water as it comes from the river in winter is at 32°F. Before the pipe gallery was heated there was considerable trouble in operating the hydraulic valves which control the filters.

The three 1 mg reservoirs, concrete with shingle roofs and banked with earth on the sides, freeze about 12" deep, but this causes no trouble. Valves outside the reservoirs are in chambers with concrete covers and are covered with straw in winter. Two booster stations housed in brick buildings are heated with natural gas.

All distribution mains and services are placed with 6½ ft. cover. In 1936, the coldest winter on record and with little snow coverage, 340 ft. of 6" main froze. After using an electric welder for three days in an unsuccessful effort to thaw the main, the superintendent dug down to the main at 6 ft. intervals and placed manure in each hole and ran steam into the manure, which thawed the main. When services freeze and are thawed, a small stream of water must be kept running through them throughout the cold weather; if this is discontinued for 10 minutes the services freeze again. For electric thawing of services the charge is $10 for an hour or less and $1 for each 10 min. additional.

In the early fall all hydrants are put in good condition and checked at least once a month thereafter—weekly in severe cold weather, and immediately after use. Frozen hydrants are thawed by steam from a portable boiler.

The 72" riser to the 0.5 mg elevated tank is kept from freezing by a 1½" pipe run from the bottom to the top of the riser and back, through which is circulated hot air from a gas heater.[F72]

In Winnipeg, Canada, temperatures in January and February reach from 25° to 45° below zero. The temperature of the water as it enters the distribution system averages from 35.6° in December to 34.1° in March. The maximum frost penetration occurs late in April, and is 7 ft. under streets where the snow has been entirely removed, 6½ ft. where 6" of snow was left, and 6 ft. where no snow is removed. Formerly mains and services were laid with 6½ ft. cover, but this is now 8 ft. for services and 7 ft. for mains. About 30 services freeze in an average winter, usually in March or April, and about 250 meters. About 200 valve bonnets are frozen each winter, ground water collecting in the valve boxes and freezing around the bonnets.

Mains and services are thawed by an "Engesser" motor-driven generator and a home-made outfit using a generator driven by an automobile engine. Hydrants, valves and valve boxes are thawed by steam from two Hauck superheated steam thawers at 15 psi pressure. Thawing cost $1 to $2 per job by steam, $2 to $12 by electricity. Hydrants are inspected daily in the business and commercial areas, twice a week elsewhere.[F3]

Salt-Velocity Flow Gauging

Three salt-velocity gaugings of flow in New York City's Delaware aqueduct made in December 1944 and March and April 1945. The distance over which

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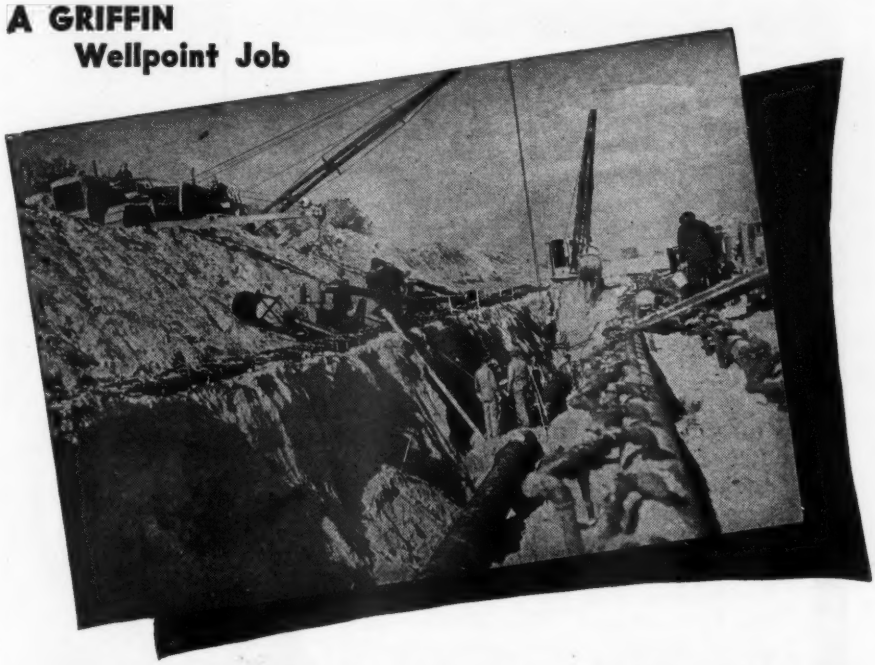

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the measurement was made was 44.5 miles, believed to be the longest distance over which this method has ever been used. In each case 500 pounds of dry salt was dumped into the water. The results were checked by weir measurements. In the first test the weir measurements indicated a flow of 130.8 mgd and the salt test 132.5. In the second test the weir showed an average flow of 253.5 mgd and the salt test 251.4 mgd. In the third test the weir measurements indicated an average of 51.5 mgd and the salt test 54.1 mgd. The water contained 0.9 to 1.1 ppm of chlorine before the salt tests and the salt slugs had maximum chlorine contents of 12.3 to 11.2 ppm. The salt slugs were from 585 ft. to 5,341 ft.[F74]

A Synthetic Resin Exchange

An improved nuclear sulfonic acid resin has been developed having 30,000 grains $CaCO_3$ per cu. ft. total exchange capacity, of which over 90% is available at high salt values. Reaction is 92% complete in one minute and equilibrium established in two. Wash water requirements are low, salt efficiencies are high, hardness breakthrough is very rapid at the completion of the run, and units may be operated at flow rates as high as 10-15 gal. per sq. ft. per minute. At pH values below 9.5 the resin is stable even to boiling water: Any concentration of salt brine may be used for regeneration. A simple acid cleaning without removing the resin from the shell cleans the bed completely. Therefore the resin units can be used for turbid raw water, softening, clarifying, decoloring and partially de-alkalizing it when used in combination with alum. Silica also can be removed and a product obtained "actually the Chemical H_2O of better than 99.999% purity," at a cost usually less than 5 cts. a ton.[A132]

DDT In Water Supplies

DDT applied to any water gradually loses its ability to kill *A. aegypti* larvae, so that 0.0015 ppm becomes ineffective in 48 hours, and 0.1 ppm in from ten to twelve days.

Turbidity in water has little effect on the 48-hour kill of mosquito larvae by DDT, but upon settling out will remove some of the DDT held in suspension.

The normal concentrates of DDT used in mosquito larviciding work will not produce toxic effects in warm-blooded animals drinking water so treated.

Any of the conventional water treatment processes involving coagulation, sedimentation and filtration will remove from 80 to 98% of DDT in a water originally containing from 0.1 to 10.0 ppm. Removal to less than 0.01 ppm is possible, if intimate contact with activated carbon is provided for 15 minutes after coagulation and sedimentation but before filtration.

Discussing this paper, Harry E. Jordan said that "At the present time there is no concrete evidence to indicate that human beings are able to tolerate physiologically any substantial concentration of DDT continuously either in food or in drinking water."[A10]

Chlorine For Cleaning Pipes

Pipes carrying raw water are apt to accumulate on their walls a coating of biological growth in which is entangled fine suspended matter carried by the water. This may materially decrease the carrying capacity of the pipe. To prevent accumulation of this material, C. E. Trowbridge developed a method of giving the pipe a "shot" treatment of chlorine as infrequently as once a week, which destroys the biological growth before any considerable amount can become attached to the pipe. To feed the chlorine in unusually large doses in a large flow of water would exceed the capacity of a regular chlori-

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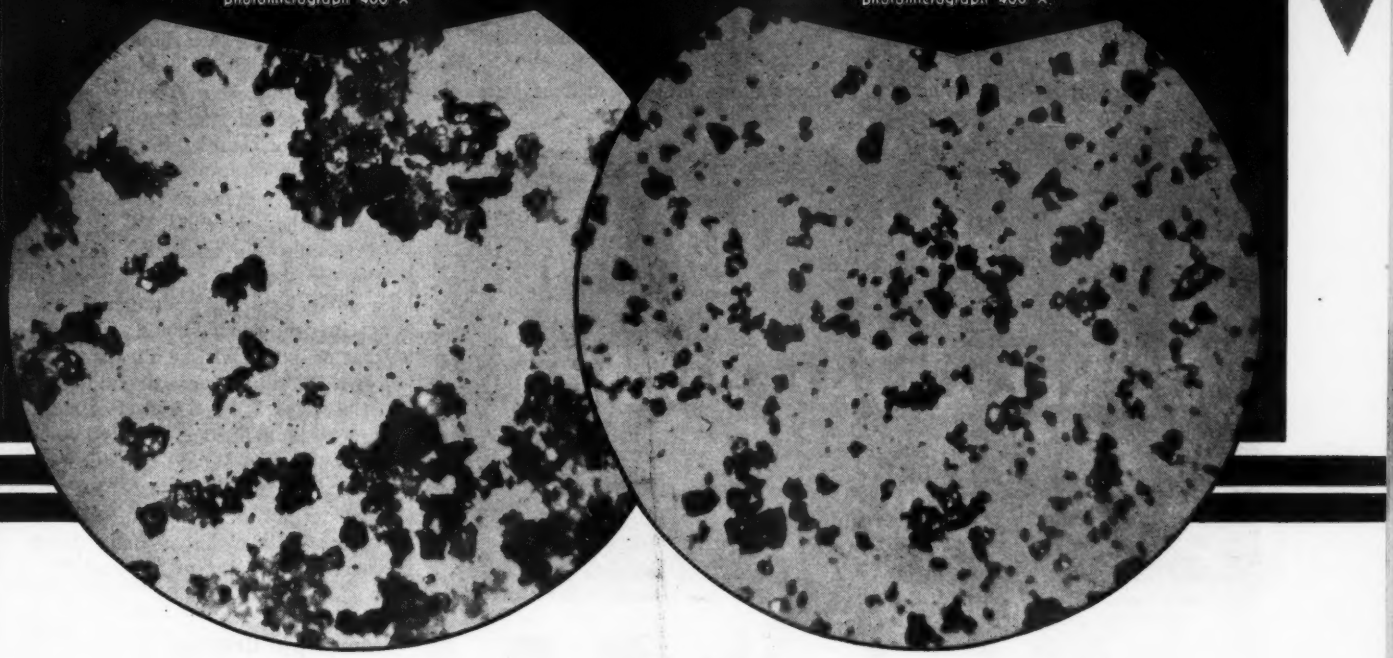
photomicrograph 400 X

When Pozzolith, (Cement Dispersion) is added, the cement particles DISPERSE or SEPARATE like this, resulting in: (1) more complete wetting (hydration) of the particles, thereby putting more of the cement to work (2) release of the entrapped water, thereby reducing the amount of mixing water required.

photomicrograph 400 X



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CEMENT DISPERSION

nator, so a cylinder of liquid chlorine is poured directly into the main. At East St. Louis, where the treatment was first tried, the capacity of a pipe line was increased more than 20%.[X1]

Bidding From Sales Engineers' Viewpoint

The opinions of sales engineers and contractors on details of bidding and specifications were asked and there seemed to be a general agreement on the following:

All bidders should be required to deposit a sum of money when receiving plans and specifications, this sum to be returned when the plans and specifications are returned in good order. Bid bonds should not be accepted in place of certified checks.

The contractor should be allowed to deposit cash or money bonds in place of a surety or performance bond of a bonding company.

"Unbalanced" itemized bids should be rejected.

The municipality should not be held responsible for payment of materials when the contract for construction work includes furnishing the materials.

Bids for materials should include delivery on the job (such as stringing water pipe along the street) only when the material can be delivered by truck from the source of supply to the job.

The equipment distributor should make his bid direct to the utility or user and not to the contractor.

Calls for bids for equipment should be advertised except under special conditions. (In many municipalities bidding is required by law).

Bids including alternates for furnishing certain materials and equipment should generally be allowed.

Completion date should be stipulated by the bidder; but some courts have decided that if a penalty is provided for non-completion it must be offset by a bonus for completion ahead of time.

"Financial responsibility" should not be the only criterion permitted for rejecting the lowest bid.

Placing the engineer's inspector on the contractor's payroll should not be countenanced for a minute.

Specifications should not stipulate that no extras will be allowed.

In bidding for excavation, special price should be asked for rock, and "rock" be defined as clearly as possible.

Contractors should be called upon to guarantee the workmanship of their contract for 6 mos. or a year, but not to maintain the system from occurrences not due to his work.[A5]

Taxing Municipal Utilities

A decision of the Ohio Supreme Court, ruling that the real and personal property of the city of Cleveland, used for its municipally owned traction system, was not exempt from taxation, may be held to apply to municipal water systems and rental-supported sewer systems. It held that a municipality forfeits immunity from taxation upon entering private competitive business.[A6]

Benefits From Coagulation

When a well-defined floc is developed in water it will effectively remove turbidity, color and bacteria and will aid in the reduction of tastes and odors. Operation and effluent quality will be improved. The simple jar test is the best method for determining the proper treatment to be given the water, insuring against underdosing or overdosing.[A9]

Watershed Forests Are Valuable Assets

Adequate forest cover builds up a thick humus of mulch which, with the root systems of the trees, serves as a sponge to hold the water, prevents erosion and resulting silting of reservoirs and prevents freezing to considerable depths. The trees furnish revenue from the sale of sawlogs, poles, cross-ties, fuel wood, etc. One municipal watershed

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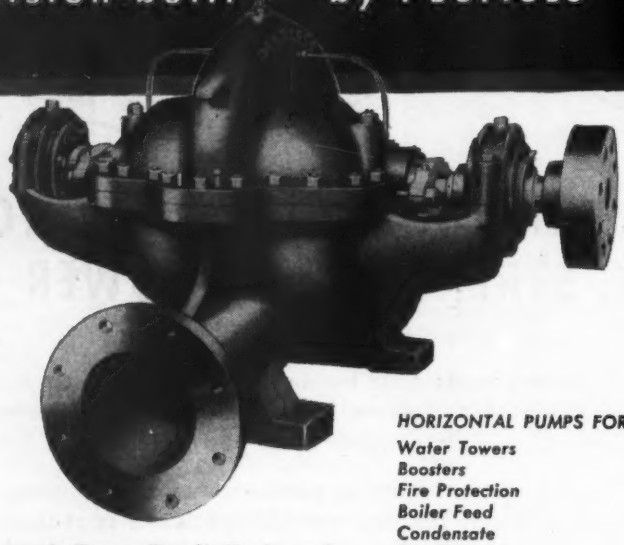

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in Vermont gives sufficient returns to pay for the entire original cost of land for the reservoir and adjoining watershed.

In 1930 there were about 860 community forests in this country, and in 1938 there were about 1,500, and there are probably more than 2,000 now. More than 177 of these are in Massachusetts, about 100 in New Hampshire, 44 in Vermont and 25 in Maine. In New York State more than 175,000,000 trees have been planted in such forests.

Trees are generally planted 6 x 6 ft. apart, or 1,210 to the acre. Trees can be bought for $4 to $8 per thousand; some states give them free for reforestation. Planting costs $7 to $12 per acre. Most watersheds are planted to conifers, which grow rapidly and give a greater timber crop than hard woods. Also the falling foliage does not blow into the reservoirs. In the northern and northeastern states the principal trees used are Norway or red pine, Norway spruce, white pine, Canadian white spruce, Scotch pine and European larch. In the south, shortleaf, longleaf, loblolly and slash pines. In the far west, Douglas fir is successful.

Advice can be obtained from leading forestry schools and state forestry departments, the U. S. Forestry Service in Washington, and extension departments of forestry and agricultural schools in nearly every state in the Union.[F1]

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c, indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

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2. Public Relations in the Waterworks Field. By E. L. Filby. Pp. 1270-1272.
3. Customer Accounting. By Marshall S. Dutton. Pp. 1273-1279.
4. Municipal Accounting. By Paul L. Sandberg. Pp. 1280-1288.
5. Sales Engineers' Viewpoint on Tendering for Waterworks Equipment. By William Storrie. Pp. 1289-1292.
6. Taxation of Municipal Utilities. Court Decision. Pp. 1293-1297.
7. Waterworks Industry's Attitude on Grounding and Stray Current Problems. By Charles F. Myersherm. Pp. 1298-1299.
8. Maintenance Problems. By A. A. Ulrich. Pp. 1300-1304.
9. Coagulation and Benefits from Good Floc Formation. By R. W. Ockershausen. Pp. 1305-1309.
10. The Removal of DDT from Water Supplies. By John A. Carollo. Pp. 1310-1317.
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1. Water Supply and Sewage Works for the Atomic Bomb City. By G. E. Crosby and P. T. Streander. Pp. 153-156.

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2. *p*. Water Treatment to Reduce Chemical Odors. By Lawson & Haynes and Wallace Grant. Pp. 331-334.
3. Some Problems and Considerations in Open Channel Flow Measurement. By R. E. Sprenkle. Pp. 345-349.

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2. *p*. Valving Out Pipeline Surges. P. 119.

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2. Partial Electrification of Plattsmouth's Pumping Plant. By Robert Cappell. P. 26.
3. Elimination of Tastes and Odors from an Army Post Water Supply. By Lt. Col. F. H. Stover. Pp. 30, 32.
4. Repairing a Cracked Water Main. P. 34.
5. Activated Silica for Winter Use of Activated Carbon. Pp. 53-54.

X *Water*
December

1. "Shots" of Chlorine for Pipe Lines. P. 16.

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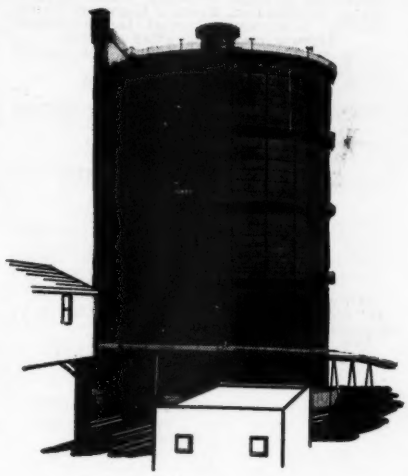

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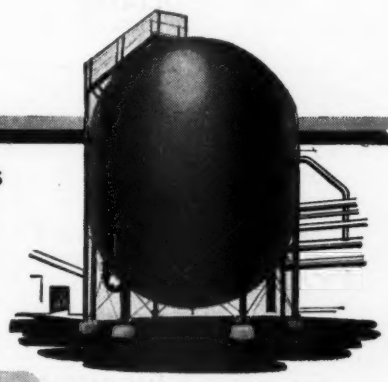

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T. W. Gramm

Melrose Park, Illinois, the office will be managed by T. W. Gramm. Formerly manager of Homelite's Philadelphia office, "Wes" Gramm acted as a Homelite Technician with the Army and Navy during the war.

Designs of Wood Hangars for Small 'Planes Offered by Teco

Minimum cost, wood hangars, made possible by the Teco Timber connector system of construction, are featured in Low Cost Housing For Small Airplanes, a pamphlet being distributed to airport managers and owners of small 'planes and aviation enterprises by the Timber Engineering Company.

The publication presents basic ideas on the layout and construction of individual hangars in single and multiple units, repair shops, and large commercial hangars. Points covered include 15 to 60 percent lower first cost, lower annual charges, greater salvage value, lower rents, use of local labor, pleasing appearance, durability, flexibility, prefabrication, insulation, and fire safety. Sample layouts are diagrammed.

Copies of the pamphlet, typical designs and details are available free of charge from the Timber Engineering Company, 1319 Eighteenth Street, N. W., Washington 6, D. C.

H. Z. Hight, recently appointed general sales manager for Dresser Mfg. Co.

Lighting Tailored for the Small Airport

The equipment is engineered for these special needs and not simply a cut-down version of the high-powered apparatus for the commercial-line airports. It is a new wind cone and a new rotating beacon developed for small airports by Westinghouse Lighting engineers. The wind cone employs four 50-watt lamps instead of four 200-watt lamps, but it can be seen as far as necessary in any type of weather for which the airport is used.

The rotating beacon delivers 100,000 cp instead of 2,000,000. Rather than using an elaborate lamp-changing mechanism to insure continuity of service even should a lamp burn out, the new one has two separate lamps and two separate, but much simpler, lens systems. Instead of a powerful turning motor a 1/100-hp motor and gear provides beacon rotation. All rotating mechanism is enclosed, hence the unit is free from ice troubles.

Book Reviews

Highway Traffic Conference Proceedings. Papers presented at the second annual Eno Traffic Conference. 139 pp. Published by the Eno Foundation for Highway Traffic Control, Saugatuck, Conn. Among the papers are "Getting Public Support for Traffic Control;" "Traffic Training Programs;" "The Evolution of Traffic;" "Every Policeman a Traffic Officer;" "Designing Suburban and Rural Roadways for Pedestrian Traffic;" "The Uses of Traffic Data in Highway Planning and Design;" and "Vehicles and Roadways for Post-War Transit Operation."

Legal Aspects of Controlling Highway Access. By David R. Levin, Transportation Economist, Public Roads Administration. 46 pp. For sale by the Supt. of Documents, Washington, D. C.

The controlled-access highway has been sanctioned by general statute in 20 states and others are contemplating such legislation. This pamphlet discusses the need for such highways and for laws regarding them, legal decisions on existing laws, and the various legal points involved in right of access, circuity of travel, diversion of traffic, property taken, right of view and others.

Compaction of Subgrades and Embankments Treated in Concise and Comprehensive Bulletin

Written and issued only to supply the immediate emergency importance to engineers of information on the compaction of subgrades and embankments, nevertheless bulletin #11 of the Highway Research Board's Department of Soil Investigations, of which C. S. Hogentogler is chairman, should serve for some time as a concise source of ready reference to all who have the construction of highways in their field of activities.

In its 25 pages are condensed most, if not all, of the theory upon which the design of an adequate and long-lived subgrade must be based. While many of the supporting facts are necessarily condensed, most of the critical ones are given in full. A more complete display of important facts and theories may, no doubt, be found in one or more of the 34 books and articles listed among the References appended to the text.

Starting out with a few paragraphs of definitions and general considerations, the moisture-density relations as they affect compaction are then competently analyzed, and the various more-or-less standard tests to determine the moisture content needed to produce maximum density are described.

Next the determining characteristics of various soils are considered. The "standard" grouping of soils is fully treated together with a competent consideration of the characteristics of soils suitable for embankments.

The control of the relationship of moisture and density is treated at some length, and the factors limiting any moisture-density control program are evaluated. Approved, or suggested, laboratory methods for density determinations are described, as well as the best methods of securing optimum moisture and density in the actual works.

Following the above theoretic considerations, the design and construction of embankments is gone into in some detail. The proper slope to be given an embankment constructed of a soil

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Readers' Service Department

These booklets are FREE but distribution is restricted to those actively engaged in engineering or construction. Use the coupon or write the manufacturer direct, mentioning PUBLIC WORKS.

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1. New bulletins describe and illustrate LeRoi Portable Compressors in sizes from 60 to 500 c.f.m., gasoline or Diesel powered on mountings to fit your special needs. Same manufacturer makes both compressor and engine. Write LeRoi Company, 1770 So. 68th St., Milwaukee 14, Wis.

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11. Good illustrations and useful data on all types of Heltzel Highway Bins, for truck mixer charging, bulk cement plants, enclosed bucket elevators, belt conveyors, etc. Heltzel Steel Form & Iron Co., Warren, O.

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38. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit 26, Mich.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Concrete, More Durable

50. How cement dispersion assures improved concrete with impressive economies in initial constructon costs and maintenance costs is the subject of new literature available from The Master Builders Co., 7016 Euclid Ave., Cleveland 3, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

Forms, Curb and Gutter

78. Curb and Gutter and Sidewalk Forms. Many types available, including battered face curb form especially for modern traffic conditions. Heltzel Steel Form & Iron Co., Warren, O., will send booklets on request.

Generators

80. Two portable generators, one for AC and the other for DC current are described in new bulletin issued by Homelite Corp., Port Chester, N. Y. Commonly used for operating electrical equipment in planes, tanks and trucks, or to charge batteries or to supplement batteries for starting main engines, etc.

Graders, Patrol

98. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Co., Aurora, Ill.

Industrial Power

100. International power units in both diesel and carburetor types provide money saving power for many purposes. Send for latest catalog. International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.

Joints, Contraction

101. How to get the highest contraction joints at least cost. Ask Highway Steel Products Co., Chicago Heights, Ill., to send you a folder on "Keylode" Contraction Joints.

Joints, Expansion

102. Para-Plastic hot-poured rubber joint sealing compounds, Premoulded Asphalt Expansion Joint. Premoulded Fibre Expansion Joint, Premoulded Cork Expansion Joint, Premoulded Cork Rubber Expansion Joint, Self-Expanding Cork Expansion Joint, Premoulded Sponge Rubber Expansion Joint and Waterstop Expansion Joint are described and illustrated. Write Servicised Products Corporation, 6051 W. 65th St., Chicago 38, for a copy.

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104. Jaeger Fleet Foot Loader, Crane, Excavator, in sizes ½ yd. to 2 yd. is described in new illustrated catalog. Full 180° swing allows loading trucks from both sides. For your copy write The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, O.

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105. Enduring Bronze honor roll, war memorials, etc., for public places. For descriptive literature address C. H. Buck & Co., 99 Chauncey St., Boston, Mass.

106. Honor rolls, memorials, sculptured bas-reliefs, plaques, tablets, name plates and letters of bronze are illustrated and described in folder sent on request to Architectural Bronze & Aluminum Corp., 2342 W. Belmont Ave., Chicago 18, Ill.

Mud-Jack Method

107. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee 10, Wis.

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110. Mark-Time Parking Meters, self-winding, simple, big dial meters are now available. Described in literature issued by M. H. Rhodes, Inc., 30 Bartholomew Ave., Hartford 6, Conn.

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111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 illus. Write to The Barrett Div., 40 Rector St., New York 6, N. Y.

Piling, Steel

112. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Steel Co., 1820 N. Central Ave., Chicago 39, Ill.

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113. The full line of Osgood power shovels, cranes, draglines, and clam shells is illustrated in detail and described in comprehensive booklets issued by The Osgood Co., Marion, Ohio.

Pumps

116. New illustrated catalog and specifications of Jaeger "Sure-prime" Pumps 1½" to 10" size, 3,000 to 240,000 GPH capacities. Also Jetting, Caisson, Road Pumps and Wellpoint Systems. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, O.

117. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

118. 16 - page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee 12, Wis.

Road Building and Maintenance

126. Two and Four Wheel Scrapers, Bulldozers, Tamping Rollers, Winches, Hoists and Repair Towers are subject of special bulletins issued by Gar Wood Industries, 7924 Riopelle St., Detroit 11, Mich.

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154. "Soil Stabilization with Tarvia"—An illustrated booklet describing the steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Division, 40 Rector St., New York 6, N. Y.

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187. Jaeger Paving equipment, including Mix-in Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers. Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

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305. Eight page catalog, "Fire-Fighters," describes in detail, the Carter "Chief" and Carter "Warden" fire-fighters. These units manufactured in both the stationary and portable types are self-priming and have official underwriters approval. Address: Ralph B. Carter Co., Hackensack, N. J.

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357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia 42, Pa.

358. Air Valves are the subject of Rensselaer Bulletin Q in which Air Release as well as Air and Vacuum, types are described. Address: Rensselaer Valve Co., Troy, N. Y.

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360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York 6, N. Y.

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367. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester 6, Mass.

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386. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boulevard, Los Angeles 34, Calif.

387. Literature illustrating how cities, towns and villages using OK Champion Sewer Cleaners are doing a complete sewer cleaning job from street level. Three sizes of machines available in addition to full line of sewer rods and accessories. Issued by Champion Corporation, 4752 Sheffield Avenue, Hammond, Indiana.

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Corrosion Prevention, Water Tanks

390. "Preventing Corrosion of Steel Water Storage Tanks" is the subject of an interesting, illustrated bulletin issued by Electro Rust-Proofing Corp., Dayton 10, Ohio. Gives full description of Rustop System of prevention.

Corrosion Resistant Metal

391. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. The American Brass Company, 25 Broadway, New York.

Diesel Engines

394. "Blue Streak" engines for 425 and 495 hp are described in Bulletin No. S 329; also Bulletins SA 341 and 342 for small and medium power service. Write Climax Engineering Co., 111 W. Monroe St., Chicago, Ill.

395. Illustrated engineering data fully explains the operating economy and job adaptability of the new Viking Diesel Engines. Six and eight cylinder models for continuous duty or stand-by service. Write Sterling Engine Co., 1299 Niagara St., Buffalo 13, N. Y.

Engines

396. Full details of LeRoi engines for continuous or intermittent duty are given in new illustrated bulletins. Write LeRoi Co., 1770 So. 68th St., Milwaukee 14, Wis.

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399. Feeders of all types including Hypochlorinators, Reagent Feeders, Dry Chemical Feeders, Chlorinators and Ammoniators are available in a wide range of capacities for feeding all of the usual chemicals used in sanitation practice—manufactured by Wallace & Tiernan Co., Newark 1, N. J.

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401. Gravimetric Feeder, Loss-in-weight type (formerly called batch type), measures and feeds dry or liquid materials by weight. Illustrated bulletin issued by Omega Machine Co., Inc., 96 Codding St., Providence 1, R. I.

Filters, Vacuum

403. For bulletins on Vacuum Filters for dewatering primary, activated, digested or chemical sludge, write The Conkey Co., 420 Lexington Ave., New York 17, N. Y.

Fire Hydrants

405. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.

406. See listing No. 438.

Flow Meters

409. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (C42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia 42, Pa.

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411. For information on the use of Climax engines with sewage gas for developing power around the sewage plant write Climax Engineering Co., 111 W. Monroe St., Chicago, Ill.

Gas Holders

412. The Stacey Brothers Gas Construction Company, designers and manufacturers of gas holders, has issued a 16-page bulletin which gives many helpful facts and detailed information on the development of corrosion—and how to combat it—in gas holders. A copy of this bulletin will be mailed to anyone sending their request to The Stacey Bros. Gas Construction Company, 5535 Vine St., Cincinnati 16, Ohio.

Gates, Valves, Hydrants

413. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

415. See listing No. 438.

417. Rensselaer Gate Valves of high tensile strength, corrosion resistant iron are described in Rensselaer Bulletin X. Address Rensselaer Valve Co., Troy, N. Y.

418. A new four-page folder on MUELLER-COLUMBIAN Gate Valves gives construction details, shows various type of gear drive mechanism available, and has handy check list of dimensional data. White Mueller Co., Chattanooga 1, Tenn.

Gauges

421. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia 42, Pa.

Generating Sets, Diesel

422. New booklet describes Sheppard Diesel Generating Sets that make low cost electricity from cheap fuel and give dependable service in the hands of any average operator. Write R. H. Sheppard Co., 250 Middle St., Hanover, Pa.

Laboratory Equipment

423. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar de-

vices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore 4, Md.

Manhole Covers and Inlets

429. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend 23, Ind.

Meter Setting and Testing

431. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Meters, Venturi

432. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corrosion, clogged pipes, etc. Write Builders-Providence, Inc., 9 Codding St., Providence 1, R. I.

433. "The Selection of Main Line Meters," a highly informative and useful presentation prepared by a competent engineer, J. C. Thoresen, describes forms of differential producers and quickly solves typical problems with the use of graphic charts. Write Builders-Providence, Inc., 9 Codding St., Providence 1, R. I.

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434. "Watchdog" water meters, made in standard capacities from 20 GPM up; frost-proof or split case in household sizes. All parts interchangeable with present models of same manufacturer. For bulletins, write Worthington-Gamon Meter Co., 282-296 South St., Newark, N. J.

Pipe, Cast Iron

436. Handbook of Universal Cast Iron Pipe and Fittings, pocket size. 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York 16, New York.

437. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super - deLavaud centrifugally - cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

438. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Pipe Forms

440. Making concrete pipe on the job to give employment at home is the subject of a booklet by Quinn Wire & Iron Works. 1621 12th St., Boone, Ia., manufacturers of "Heavy Duty" Pipe Forms. Sent promptly on request.

Pipe Pusher

444. One-man-operated Hydraulic Pipe Pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts and prices, ask for booklet S-117. Greenlee Tool Co., 2042 Columbia Ave., Rockford, Ill.

Pipe, Transite

445. Two new illustrated booklets. "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York 16, N. Y.

Pipe Joints, Sewer

447. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston, Adams, Mass.

Pipe Joint Compounds

450. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps, Sludge

452. Non-clogging, vertical or horizontal, dry pit or submerged; storm water and drainage pumps are described in several Bulletins; also sump and bilge pumps. Peerless Pump Div., Quincy, Ill.

Pumps and Well Water Systems

454. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis 8, Tenn.

455. Peerless pumps in a variety of types, with oil or water lubrication and any power drive, to pump water from any depth are described and illustrated in new literature that clearly shows their construction and special features. Write Peerless Pump Div., Food Machinery Corp., 301 W Ave. at 26th St., Los Angeles 31, Calif.

456. Oil lubricated turbine pumps with open impellers. Five types of heads available. Specifications and illustrations in new bulletin 6930M-2 issued by Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.

457. Centrifugal Pumps of various designs—single-stage, double-suction, split casing; single-stage single-suction; two-stage opposed impeller; three-stage; high-pressure; fire pumps; close-coupled. A bulletin for each type. Peerless Pump Div., Food Machinery Corp., Quincy, Ill.

Rubbish Collection

459. For saving trucks, labor, and time in city rubbish collection get details of the new Dumpster-Kolector described in literature just published by Dempster Brothers, Inc., Knoxville 17, Tenn.

Screens

460. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

Sludge Drying and Incineration

463 Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

Softening

466. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago 4, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

467. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York 18, N. Y.

Sprinkling Filters

469. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

Swimming Pools

474. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data, prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

476. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York 17, N. Y.

477. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

Treatment

478. Carter Mechanical Mixing Equipment is described in bulletin #4501. Recently issued this catalog illustrates in detail, the various mechanical mixing mechanisms for water, sewage, and industrial waste treatment manufactured by the Ralph B. Carter Co., Hackensack, N. J.

479. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

480. New booklet (No. 1642) on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

481. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

482. "Sedimentation with Dorr Clarificers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

483. A combination mechanical clarifier and mechanical digester. The Dorr Clarigester is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

484. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

486. 28-page catalog describes and illustrates the Dorrco Hydro-Treator, a self-contained water treatment unit combining Flocculation, Sludge Thickening and Clarification. Reduces treatment time and lowers plant construction costs. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

488. "Packaged" Sewage Treatment Plants, specifically developed for small communities — 100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2438 Wolfram St., Chicago 18, Ill.

490. New bulletin fully describes and illustrates Hardinge sludge collectors for clarifiers, sludge concentration and skimming in both circular and rectangular tanks. Write Hardinge Company, Inc., York, Pa.

491. Data and complete information on Carter Fixed Roof Digester mechanisms are given in eight page bulletin #4311. Structural details of unit and typical specifications are also included. Write the Ralph B. Carter Co., Hackensack, N. J.

Underdrains, Trickling Filter

492. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh 12, Pa., for free copy.

Valves (See Gates, Air Release, etc.)

Water Treatment

495. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago 4, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

496. "Use of copper sulphate in water treatment plants" titles informative booklet, with valuable data on chemicals, dosage, etc. Write Tennessee Corporation, Atlanta 1, Ga.

497. Ferri-floc Ferric Sulphate — a new, valuable booklet on coagulation for water and sewage treatment plants. Write Tennessee Corporation, Atlanta 1, Ga.

499. "Important Factors in Coagulation" is an excellent review with bibliography and outlines of latest work done in the field. Written by Burton W. Graham and sent free on request to Stuart-Brumley Corp., 516 No. Charles St., Baltimore, Md.

Water Service Devices

506. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio.

Wellpoint Systems

508. Catalogue, 60 pp., with many job illustrations describing the use of a Wellpoint System in dewatering construction projects. Complete illustrations and descriptions of wellpoint pumps, wellpoints, header lines and fittings, jetting pumps and hose. Griffin Wellpoint Corporation, 881 East 141st Street, New York 54, N. Y.

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They last for years,
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having various characteristics is considered, along with the best methods of constructing an embankment.

The advantages of employing precise laboratory test methods as against visual inspection are brought out. The construction costs brought about by holding to the more refined method of compaction-determination are shown to be increased by half the reporting states. About one third reported no change in costs, while the balance had no information.

Many additional and definite facts—too numerous to mention in detail at this point—are included in this bulletin. Of incalculable value for ready reference is an appendix which contains the classification of soils which was outlined by Harold Allen in 1942.

Bulletin No. 11 is issued by the Highway Research Board, Division of Engineering and Industrial Research, National Research Council, 2101 Constitution Ave., Washington 25, D. C.

American Water Works Association

The first post-war convention of the AWWA will be held in St. Louis, Mo., on May 6 to 10—Monday to Friday. Meetings will be held in the Municipal Auditorium and there will be exhibits of water works equipment. Hotel rooms will be assigned through the St. Louis Convention Housing Bureau, and we are told it will be useless to write directly to any St. Louis hotel.

PERSONALS

Lt. Col. Walter M. Culley, Sn.C., for the past four years chief sanitary engineer of the Second Service Command and stationed at Governors Island, has become assistant sanitary engineer of the National Biscuit Company with office in New York City. Col. Culley was formerly engineer of the Chester (Pa.) Municipal Authority Water Service.

Lt. Col. J. J. Gilbert, Sn.C., has been appointed manager of the Sanitary Engineering Division of Link-Belt Co., and will have his office at the Philadelphia Plant. Col. Gilbert was assistant director of the Sanitary Engineering Division of the Medical Department of the Army. He contributed greatly to the development of the Sanitary Corps, and to its leadership. He recently returned from a special mission in the European Theater.

Lt. Col. Lloyd K. Clark, Sn.C., has resumed his position as Director of the Sanitary Engineering Division, North Dakota State Board of Health. Col. Clark entered the Army in March, 1941 as a Lieutenant. He distinguished himself in the operations in the Pacific, and received a commendation (his second) for reconstructing the Manila water and sewerage systems after its recapture.

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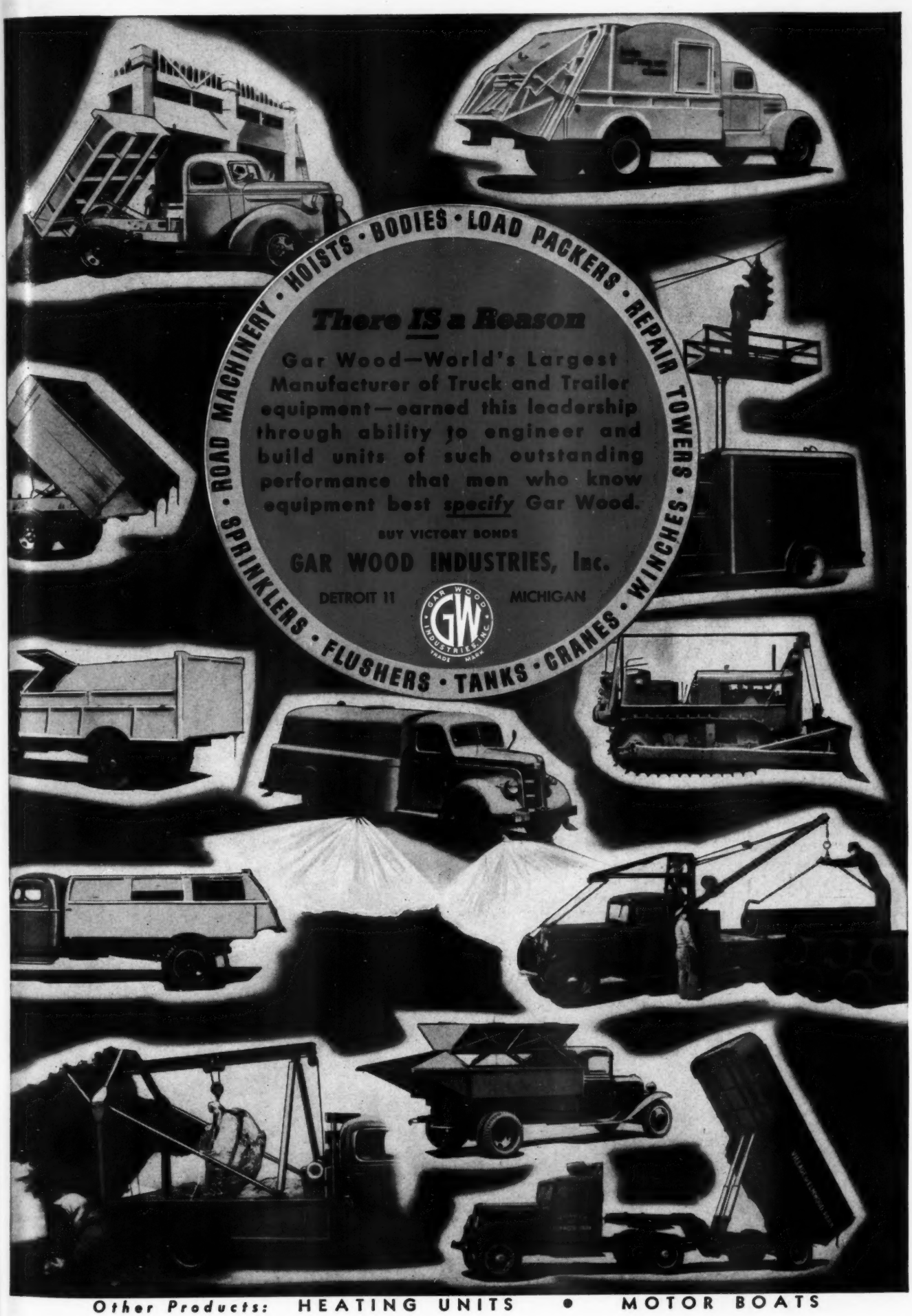
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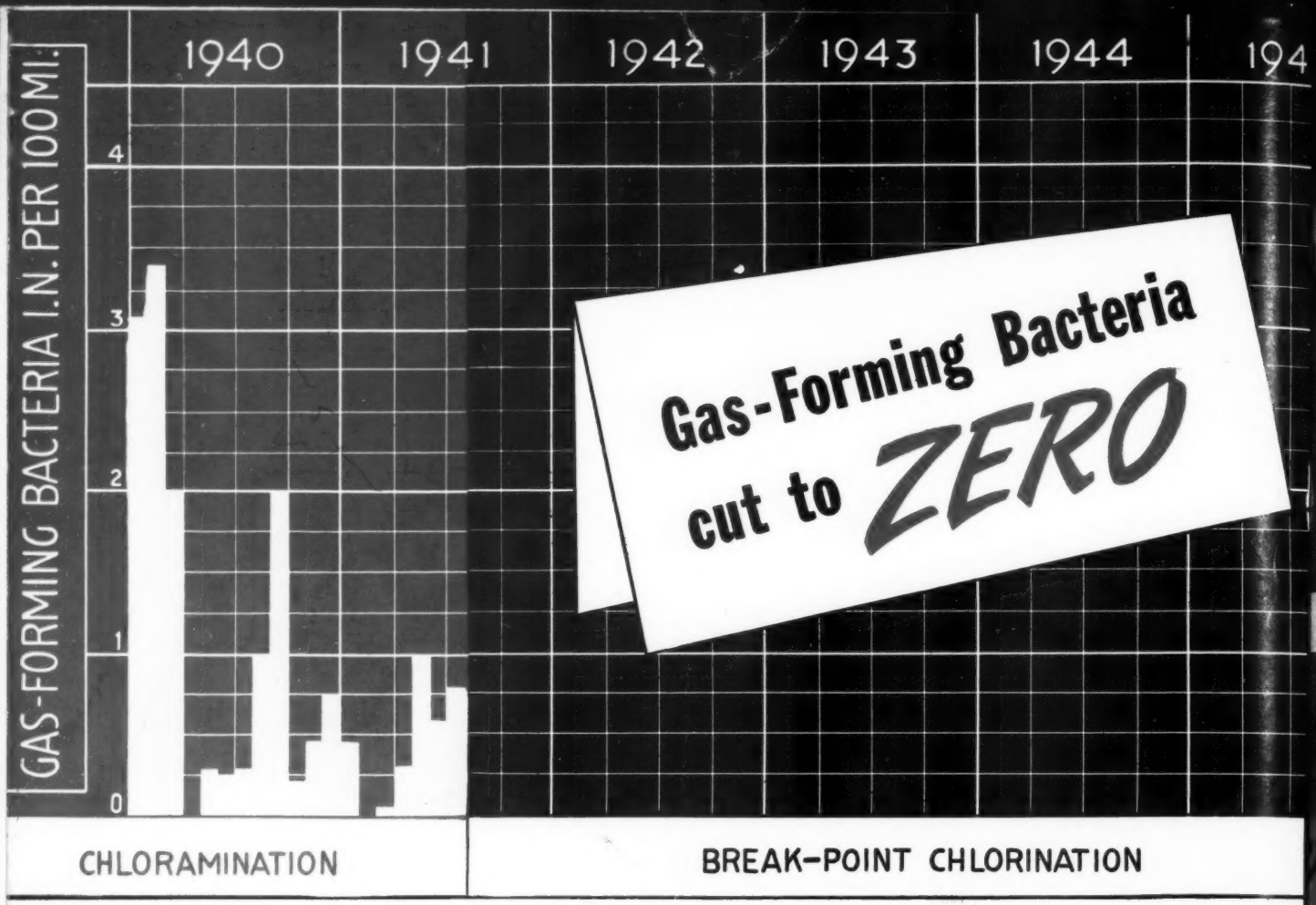

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Following the lead of places employing such modern water treatment methods, many other communities are planning for this SAFETY-PLUS insurance.

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	CHLORA-MINATION	B-P CHLOR.	CHANGE
Tot. Bact. per ml (avg.)			
Raw	400.	458.	+14.5%
Applied	14.0	3.7	−73.5%
Filtered	2.6	0.6	−76.9%
Finished	2.2	0.4	−81.8%
I. N. (Indicated Number) Gas-forming Organisms per 100 ml			
Raw	1594.8	587.6	−63.1%
Applied	13.35	0.014	−99.8%
Filtered	1.69	0.022	−98.6%
Finished	0.94	0.000	−100.0%

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